METAL FINISHING

PREPARATION, ELECTROPLATING, COATING

PUBLISHED FOR THIRTY-SEVEN YEARS AS METAL INDUSTRY

ST ENGINEERING LIBRARY

DEC 19 1946

One of ONEIDA LTD.'S finest



Finished by the LEA Method with LEA Materials

This beautiful hollowware Tea Service, made by Oneida Ltd. of "Community, The Finest Silverplate" fame, is another outstanding example of this company's fine metalwork finished by the LEA Method with LEA Compositions.

Finishing is important at ONEIDA LTD.! Intricate design or plain surface, both require the best in finishing methods and materials – and, for this important work, on most articles LEA is very much in the picture.

Perhaps you are looking for higher quality, lower cost finishing methods. If so, why not call on a LEA Finishing Engineer to assist you? Tell us about your finishing problems. If possible, send us samples to test in our laboratory.

THE LEA MANUFACTURING CO.

16 CHERRY AVENUE • WATERBURY 86, CONN.

Burring, Buffing and Polishing . . . Manufacturers and Specialists in the Development of Production Methods and Compositions

Seasons Greetings

As we approach the close of another year, our thoughts cannot help but turn to those who have contributed so materially to our success . . . . our customers whom we always regard as our friends.

Many of these friendships have covered a long span of years. Others have ripened recently. Some friends we have been privileged to meet and to know personally.

May we express our deepest appreciation for their patronage and good will in the past and wishing all a

Very Merry Xmas and
A Happy New Year



FREDERICK **GUMM** *Chemical Company Inc.*

538 FOREST STREET, KEARNY, N.J.

METAL FINISHING

PREPARATION, ELECTROPLATING, COATING

Founded as Metal Industry, January, 1903 by Palmer H. Langdon, 1868-1935

VOLUME 44 DECEMBER, 1946 NUMBER 12

CONTENTS

Editorial		515
The Significance of Polarization in Electroplating	By H. Bandes	516
All Our Yesterdays—Part V	By George Spelvin	522
Plating with Gold	By H. M. Haberman	525
Identification of Plated Coatings	By George Black and Jack Sinner	529
Improved Chromium Plate	By A. L. Peach	531

DEPARTMENTS

Shop Problems	534	Associations and Societies	558
This Is Washington	536	News from California	561
Patents	539	Technical Literature	562
New Equipment and Supplies	541	Letters to the Editor	562
Business Items	548	Index to Volume 44	564
Manufacturers' Literature	555		

COMING SOON

Plating techniques with platinum, palladium and rhodium, giving methods, solution formulas and operating conditions.

•

Routine laboratory determination of sodium hydroxide in plating solutions, describing the technique used.

Technical developments in the field of metal finishing in 1946: a complete resume of the year's achievements.

•

A profusely illustrated discussion of the Hull Cell as used for control and research in all types of plating solutions.

Editorial and Business Staff

L. H. Langdon, *Publisher*
Palmer H. Langdon, *Assistant Publisher*
Richard A. Mozer, *Engineering Editor*
Thomas A. Trumbour, *Business Manager*
Joan T. Wiarda, *Advertising Manager*
George W. Grupp, *Washington Editor*
John E. Trumbour, *Equipment and News Editor*

Publication Office

11 West 42nd St., New York 18, N. Y. Telephone: PEnnsylvania 6-0226

PUBLISHED MONTHLY—Copyright 1946 by The Metal Industry Publishing Company, Incorporated, 11 West 42nd St., New York 18, N. Y. Entered February 25, 1903, at New York, N. Y., as second class matter under Act of Congress, March 3, 1879. Re-entered as second class matter June 13, 1940, at the post office at New York, N. Y., under the Act of March 3, 1879.

SUBSCRIPTION PRICES: United States, $3.00 and Canada, $3.00 per year. Other countries $7.50. Single copies 35c in U. S. and Canada, Foreign 75c. Please remit by check or money order; cash should be registered.

Contributed articles, communications, etc. on pertinent subjects are invited. Their publication, however, does not necessarily imply editorial endorsement.

Everybody WANTS **BUFFS**



We have scoured the country for more and more cotton and other cloth materials . . . still *everybody* wants more buffs.

We've hired more and more people to produce more and more buffs . . . still *everybody* wants more and more buffs.



We've applied more ingenuity and spent more time, day and night producing more and more buffs for more and more customers . . . still *everybody* wants more and more and more buffs.



So, we have had to make a very important decision, and this is it: "We have decided to make more and more and more and more buffs for more and more of our customers . . . no matter how much more work, time, cost, or materials we have to engineer to deliver these buffs so that you can produce more and more in your factories at the earliest possible date."



Just call us for *more* details. Our telephone numbers begin with FRANKLIN 4137.



MAIN PLANT AND GENERAL OFFICES, CHICAGO 6
Sales Offices in Principal Cities

VOL. 44, NO. 12 METAL FINISHING DECEMBER, 1946
PREPARATION, ELECTROPLATING, COATING

Achievement

It is with a great sense of satisfaction that we view the variety of products on display for the coming holiday season. Metal finishers especially should be proud of this testimonial to their work, for the most popular things are those which have the best finish. Attractiveness of final coating, as a result, is an important requisite in making a product more salable; this has been the philosophy of platers for many years; consequently metal finishing has grown from a tail-end neglected operation to one of the major factors in design.

Not only are retailers shelves becoming filled more and more with attractively plated articles, but machine and non-durable tools are getting added attention from platers to the end that higher efficiency results, which in turn lowers costs. Hard chromium plating on molds, dies, tools and various machine parts are common practice and industries are based on it; copper and nickel plating as masks for various sectional heat-treating operations are recognized by metallurgists as the best method of obtaining combinations of physical properties in a single piece. Hosts of other applications in industry are an integral part of the product and have as much importance as the decorative cycle has to the various appearance applications.

As the variety of metal finishing and plating applications increases, so the importance of the industry to the metals field will grow, until finally electroplating and finishing will take rightful places alongside other basic manufacturing operations, rather than being relegated to inferior positions.

With this growth in importance, metal finishing, especially job shop work, takes on added responsibility and dignity, and it becomes the function of the plater to regard his work in a new light. He must standardize; the too often encountered attitude of personal knowledge without cooperation must be replaced by a truly scientific approach. Above all, his word and his judgment in matters pertaining to finishing must be above reproach; this means he must know his business more thoroughly.

The greater field being opened means greater opportunity for achievement.

The Significance of Polarization in Electroplating

• • •

By H. Bandes

Sylvania Electric Products, Inc., Engineering Research Dept., Sylvania Center, Bayside, New York

• • •

Introduction

Polarization is a phenomenon attendant upon all electroplating operations. Since polarization affects the practice of electroplating, a knowledge both of its origin and the ways it may be controlled would be of great value.

Unfortunately, none of the many theories which have been proposed to explain the phenomenon is entirely satisfactory. One of the difficulties met in attempting to develop a theory of polarization consistent with experimental results is the inaccuracy of the existing data. For many reasons, probably the most important of which is the lack of knowledge of the effects of the many variables which must be controlled, the existing data are in the main unreliable.

Despite the generally unsatisfactory situation in respect both of theoretical knowledge and experimental observations, it is possible to examine the practice of electroplating on the basis of a plausible theory confirmed by qualitative rather than quantitative data and deduce those areas where polarization is significant. With that qualification always in mind, the significance of polarization to current efficiency, alloy deposits, structure of deposits and throwing power will be discussed.

A talk given before the Newark Branch of the AES, June 22, 1946.

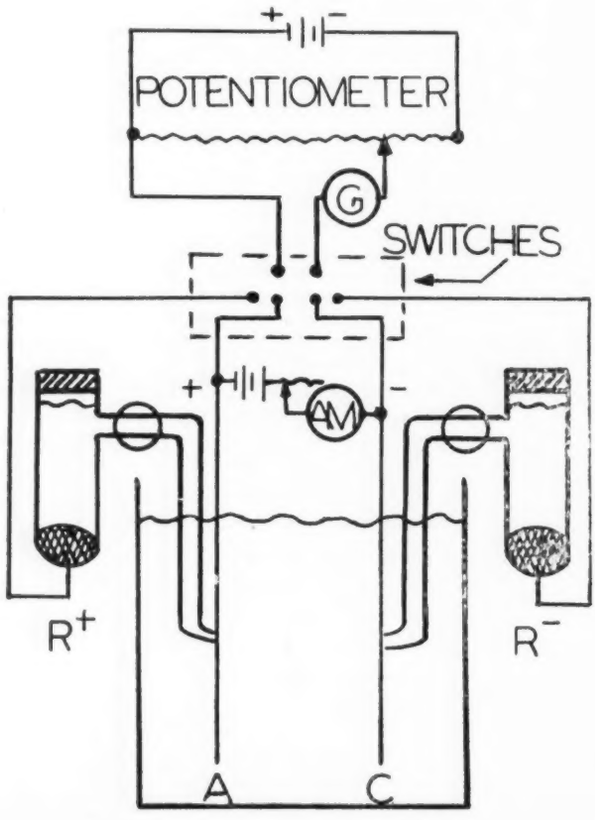


Figure 1. Set-up for measuring polarization.

Definition and Method of Measurement

For the present discussion, polarization is defined as the change in potential experienced by an electrode immersed in an electrolyte under the impetus of an applied current. Metals become more noble (toward platinum) when made the anode and less noble (toward sodium) when made cathode. Note that the foregoing definition does not distinguish between overvoltage and polarization. In fact, overvoltage may be thought of as a special case of polarization (as defined heretofore). Polarization may be measured with the setup shown in Figure 1, in which A and C designate the anode and cathode, respectively, while the reference electrodes (calomel, mercuruous sulfate, silver-silver chloride, etc.) are symbolized by R^+ and R^-.

In operation, the potential differences between the anode and cathode and their respective reference electrodes are measured in sequence with the potentiometer (See Figure 1) before current is passed through the cell. Then a definite current, as measured by the ammeter, *AM* is allowed to flow and the potential differences between the anode, cathode and their respective reference electrodes again measured. For each increase in current a new set of potential readings is obtained. The Polarization Potential is defined by the equation:

(1) $$E_p = E_r - E_s$$

where E_p = polarization potential at a current density of I amperes/unit area.

E_r = potential of an electrode vs. its reference electrode for a current density of I amperes/unit area.

E_s = potential difference between an electrode and its reference electrode for zero current density.

The potential E_s is not necessarily the single electrode potential given in the Standard Electromotive Force Series. Rather, it is a base point from which potential changes are measured and is characteristic of the particular electrode-plating solution system un-

der discussion. The tabulated Standard Electrode Potentials, characterized by the symbol E_o, are values measured *or computed* for highly idealized conditions seldom, if ever, encountered in plating operations.

The polarization potentials may be plotted against current density, as shown in Figure 2, in which the quantities sometimes known as anodic and cathodic overvoltage are also included. As mentioned previously, no further distinction will be drawn between overvoltage and polarization. The curves of Figure 2 indicate that anode and cathode are both of the same metal; if this were not the case, the potential difference between anode and cathode would not equal zero for zero current density.

Qualitatively, it is well established that polarization:

(1) increases with current density,

(2) increases with duration of electrolysis for a constant current density,

(3) decreases with increase in temperature,

(4) decreases with agitation,

(5) depends upon the nature of the electrode surface,

(6) varies with the material of the electrode.

No single theory of polarization is in agreement with all six of the foregoing generalizations. However, the belief that polarization is due to changes in ionic concentration in the immediate vicinity of the electrode is in harmony with the first four generalizations. Accordingly, and with full realization of its inadequacies, the concentration theory of polarization will be used in the discussion which follows.

Current Efficiency and Polarization

At any electrode several reactions may occur. For instance, some of the possible reactions at the cathode in an acid copper plating solution are:

(a) $Cu^{++} + 2e \longrightarrow Cu$ (metal deposition from the cupric state),

(b) $Cu^{++} + e \longrightarrow Cu^{+}$ (reduction of cupric copper),

(c) $Cu^{+} + e \longrightarrow Cu$ (metal deposition from the cuprous state),

(d) $H^{+} + e \longrightarrow \frac{1}{2} H_2$ (hydrogen discharge).

The predominance of reaction (a) over reaction (d) is well known since current efficiencies of 100% have been reported for copper deposition from acid solutions. Reactions (b) and (c) together are equivalent to reaction (a) and, a priori, there is no reason for favoring reaction (a) to reactions (b) plus (c). Regardless of whether copper is deposited by reaction (a) or by the consecutive reactions (b) plus (c), the net result is that there is a loss of cupric ions in the immediate vicinity of the cathode. However, the cupric ions are replenished in this cathode film by two means: (a) diffusion and (b) ion transport under the influence of the applied current. So long as the rate of replenishment is approximately equal to the rate of loss by plating, i.e., at low current densities, the concentration changes at the cathode will be low as will the cathode polarization. As the rate of depletion of cupric ions exceeds the rate of replenishment, in virtue

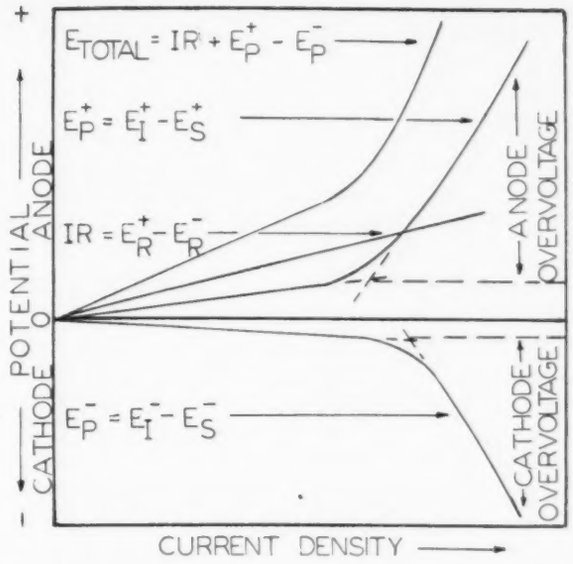


Figure 2. Anode and cathode polarization potentials, cell voltage and IR drop as functions of current density.

of higher current densities, the polarization will increase. When the polarization has risen sufficiently it requires no more energy to deposit hydrogen than copper; gassing occurs and the current efficiency falls below 100%.

For concentrations of copper as low as about 10^{-6} molar it requires less energy to deposit copper (in the absence of polarization) than to liberate hydrogen. However, for metals less noble than hydrogen, i.e., cadmium, tin, lead, zinc, iron, nickel and cobalt it requires less energy to deposit hydrogen from an acid solution (in the absence of polarization) than to deposit the metal. Yet, commercial deposition of iron, nickel, cobalt, tin, lead and zinc from acid solutions is well known despite the adverse prognosis given by the Table of Electromotive Force (See Figure 3A). The answer, of course, lies in the fact that in such cases the polarization potential of hydrogen, at normal plating current densities, is such that it requires as much or more energy to deposit hydrogen as the metal and both are, in fact, codeposited. Again, it is well known that deposition of iron, nickel, cobalt, tin, lead and zinc from acid solutions usually occurs at less than 100% cathode efficiency.

As a concrete example, let us consider nickel, where deposition from an acid solution is carried out at efficiencies seldom greater than 95%. The relative potentials before current flows are given in Figure 3A*. When the current flows, the polarization with respect to hydrogen evolution is very large and, despite the onset of polarization with respect to nickel deposition, it is somewhat less difficult to deposit nickel than it is to evolve hydrogen, as shown in Figure 3B. As a result, nickel is deposited; at 95% efficiency it is deposited 19 times as rapidly as is hydrogen. Implicit in the foregoing is the fact that the deposition potential

* The potential values of Figure 3A are taken from the Table of Standard Electrode Potentials (1). Since these potentials are highly idealized, they are used here for illustrative purposes only.

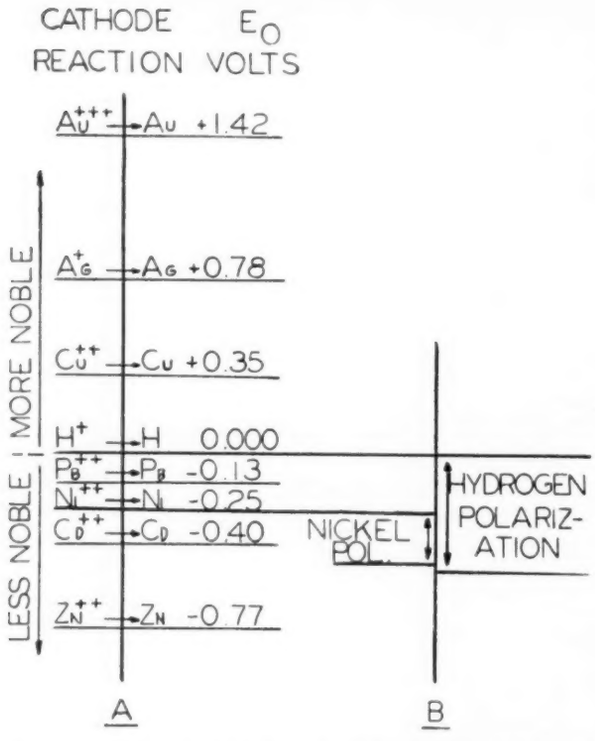


Figure 3. Standard electrode potentials of some metals and schematic hydrogen and nickel polarization potentials.

E_d, at a given current density, is the sum of the polarization potential, E_p, and the equilibrium potential E_e. Thus:

(2) $$E_d = E_p + E_e = E_r.$$

For two competing electrode processes, the predominating process will be that for which the deposition potential is the lower. As used in this discussion, the deposition potential is not a definite quantity. Rather, it is a function of polarization potential (hence of current density, temperature and agitation) and of equilibrium potential (hence of solution formulation and temperature).

A very striking example of the influence of polarization on current efficiency is given by the alkali-caustic industry. The polarization of hydrogen at a mercury cathode is so great that sodium is actually deposited on mercury from an aqueous solution despite the relative positions of hydrogen and sodium in the E.M.F. series. On electrodes other than mercury, hydrogen is deposited in preference to sodium.

It is possible to vary the current efficiency by controlling the conditions of deposition. Thus, for nickel being deposited from a nickel solution similar to the Watts bath, Macnaughtan and Hammond (2) were able to increase the current efficiency from about 75% to approximately 95% by raising the solution pH from 2.0 to 3.0.

Increasing the potential at which hydrogen is deposited will usually increase the current efficiency. If the temperature coefficient of hydrogen polarization is greater than the temperature coefficient of metal polarization, an increase in temperature will favor an increase in current efficiency. The single electrode potential of hydrogen increases about 0.06 volts per unit pH increase; consequently, high pH favors high current efficiency provided the high pH does not reduce the effective ionic concentration of the metal which is deposited. However, while a high current efficiency is generally advantageous, it is not desirable at the expense of good deposits. It is indeed unfortunate that a factor which operates so as to increase current efficiency may also operate to give poor deposits.

Alloy Deposits and Polarization

Alloy deposition is defined as the simultaneous deposition of two or more metals without regard to the metallurgical nature of the deposit. Metal deposition involving simultaneous hydrogen evolution may be considered as a special case of alloy deposition. The principles previously discussed with regard to hydrogen evolution and current efficiency also apply to alloy plating.

It has been shown that hydrogen polarization is often the determining factor affecting the rate of evolution of that element. Though metal polarizations usually are small in comparison with hydrogen polarization, it is possible to alter the equilibrium potentials* of metals by the formation of complex ions. Thus, while zinc and copper in molar acid solutions are approximately 1.1 volts separated and will not codeposit at low current densities, their deposition potentials in cyanide solutions may be made approximately equal and simultaneous deposition is possible.

Although the metal polarization potentials for a given current density are smaller than that of hydrogen, they are sufficiently large to affect the ratio at which metals are co-deposited. Thus, in Figure 4A, the polarization potentials of metals A and B increase at about the same rate with increasing current density and the relative amounts of the two metals in the deposite vary with current density.** In Figure 4B, the

---

* The potential measured when the polarizing current is zero.

** The percentage composition of the alloy is given, approximately, by % Metal A $= \frac{I_A}{I_A + I_B} \times 100$, % Metal B $= \frac{I_B}{I_A + I_B} \times 100$ where the values of the current densities I_A and I_B are taken at similar values of the deposition potentials of Metals A and B. See Reference (3).

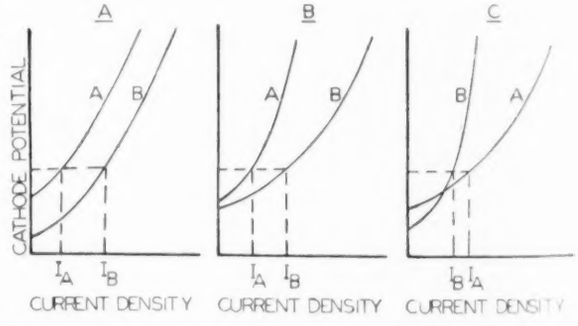


Figure 4. Schematic representation of polarization potentials for two metals which may be co-deposited.

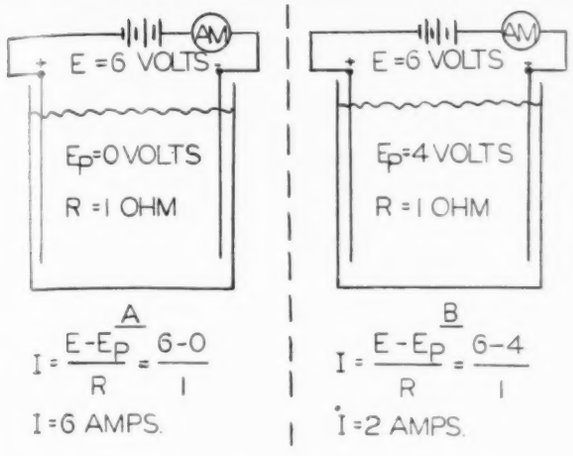


Figure 5. Influence of polarization on current.

polarization of metal A increases more rapidly than does that of metal B with increasing current density. However, since the ratio of the current densities, I_A/I_B, is essentially constant for all cathode potentials, the percentage composition of the alloy will be practically independent of current density. Finally, as shown in Figure 4C, it is possible to have the deposit rich in metal B at low current densities and rich in metal A at higher current densities.

The relative amounts of metals A and B in the deposit, for constant equilibrium potentials, will depend upon factors which affect the polarization potentials. For instance, should the temperature coefficients of polarization of the two metals differ, the percentage composition of the deposit would vary with temperature. Usually, however, the equilibrium electrode potentials of metals in solutions of their complex ions have large and often dissimilar temperature coefficients so that, even for very small values of polarization, the ratio of the metals in the deposit may vary with temperature.

In addition to temperature, solution composition exerts a considerable influence both on equilibrium potential and polarization. Finally, agitation affects the polarization and, to a lesser degree, the equilibrium potentials. As a result the control of composition of an electrodeposited alloy depends, in a very complex manner, upon temperature, current density, agitation and solution formulation. Some of the factors which are of importance in alloy plating have been discusssed at length (4); further consideration is beyond the scope of the present paper.

Structure of Deposits

It is generally agreed that the smaller the grains of an electrodeposit the brighter will be the deposit (5). The bright deposits—nickel, chromium, bright cyanide copper—have structures too fine for resolution by the optical microscope. According to some authors (6,7) bright deposits result from the inclusion of some foreign materials, organic or inorganic, in the deposit.

If the foreign matter (brightener) is metallic, the factors previously discussed under *Alloy Deposition* are operative. However, if the foreign matter is non-metallic, either organic or inorganic, the controlling factors are far more subtle and less easily understood.

As an extreme case, consider the "burning" of nickel deposits which occurs when current densities excessive for the particular combination of solution formulation, pH, temperature and degree of agitation are used. The "burnt" deposits are hard, brittle, lustreless and, often, poorly adherent.

It is well known that the solution pH rises in the vicinity of a cathode operating at less than 100% current efficiency. Henricks (7) demonstrated this fact by a simple experiment: he wrapped a strip of universal pH paper around a small electrode and then made it the cathode at high current density in an acid plating solution. After a short time he removed the electrode from the solution and unwrapped the pH paper. There was a gradual increase in pH the closer the paper was to the cathode: the pH in the body of the solution, as indicated by the outermost section of the pH paper, was approximately 3.5; the pH at the cathode, as indicated by the innermost section of the pH paper, was approximately 7.

The consequences of the increase of pH in the vicinity of the cathode are of extreme importance. Some metals, notably nickel, form insoluble hydroxides and basic salts at pH values of about 7. The ultimate particles of hydroxide or basic salt may be extremely small (of colloidal dimensions) and electrically charged. If these sub-microscopic particles carry positive charges they will be transported cataphoretically to the cathode where their charges will be neutralized. However, simultaneous with the discharge of the colloidal particles, metal is being deposited by the usual process; this metal tends to cement the non-metallic hydroxide or basic salt particles in place. The foreign matter, interfering with the orderly growth of the deposit, tends to produce fine grains and, possibly, brightness. Finally, as the concentration of metal hydroxides and basic salts increases, the deposit will become brittle and, ultimately, powdery.

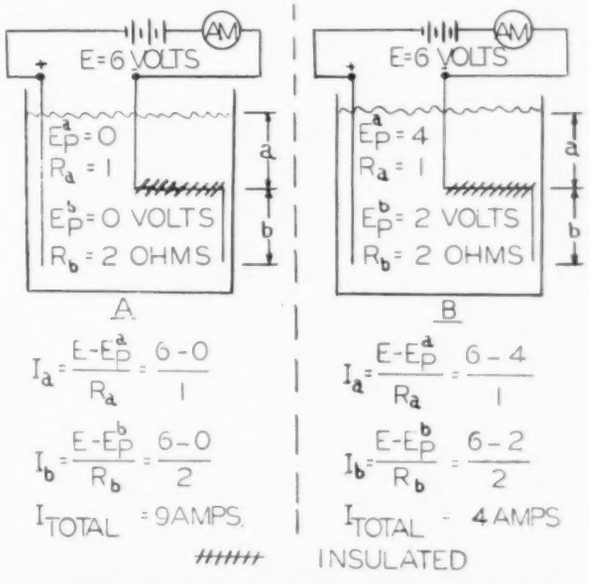


Figure 6. Redistribution of current due to polarization.

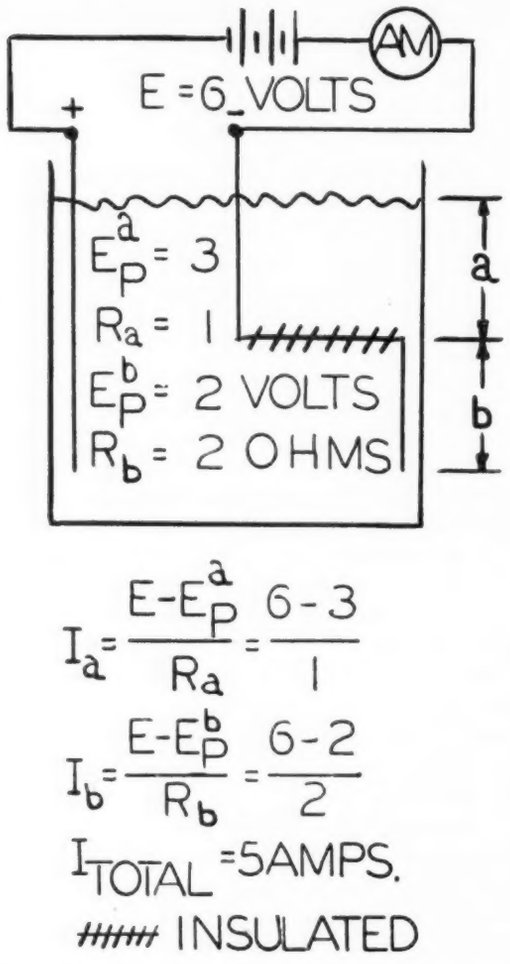


Figure 7. Redistribution of current due to polarization.

Note that the physical properties of the deposit reflect to a very considerable degree the pH of the solution at the cathode-solution interface. Hydrogen must be evolved in order for the pH to rise; the greater the rate of hydrogen evolution, the greater will be the pH increase at the cathode. In order that hydrogen may be evolved at an increasing rate it is necessary for the deposition of nickel to become increasingly difficult, i.e., the nickel polarization must rise. Clearly, then, if sound deposits of nickel are to be obtained the solution pH in the vicinity of the cathode must be kept below the value at which the insoluble nickel hydroxide and basic salts form. Two methods of accomplishing this are available: (a) use of a buffer salt and (b) reduction of the rate of hydrogen evolution. The latter may be accomplished by reducing the deposition potential of nickel, e.g., by increasing the nickel ion concentration at the cathode-electrolyte interface. Increasing the nickel ion concentration in the body of the solution, increasing the rate of diffusion by raising the temperature, and agitation will all tend to reduce the deposition potential of nickel.

It might almost seem from the preceding paragraphs that a high polarization potential is the cause of an unsatisfactory deposit. While such a belief has frequently been expressed in the literature, the author believes that both phenomena are really symptoms of profound concentration changes within the film of solution immediately adjacent to the cathode. The work of Henricks (7), as well as that of Brenner (8) and Graham and Read (9) clearly shows that such concentration gradients do exist. Note, however, that even the careful work just cited deals with solution films very thick in comparison with films of only a few molecular diameters, which probably exist in the immediate vicinity of the cathode. Probably the only satisfactory method whereby such films can be investigated is by studies of polarization, particularly of the time rate of change of polarization.

Throwing Power and Polarization

The term "Throwing Power" has been defined by many platers, used by practically all platers and measured by practically none. Various methods for evaluating the quantity have been proposed; methods such as the Haring Cell and cathodes of special geometry.

Despite the lack of agreement among the various methods, and despite the inaccuracies of any given method of measuring throwing power, it is clearly recognized that deep recesses in a given object will be plated more heavily in one solution than another for the same number of ampere minutes.

With throwing power defined, in a qualitative rather than a quantitative manner, it is possible to examine the factors responsible for the phenomenon. To the author, these seem to be: (a) polarization and (b) variations in current efficiency with current density.

As the current density increases the polarization increases* and acts as a "back potential," i.e., an additional voltage which must be exceeded if current is to flow at the original rate. The manner in which this "back potential" tends to re-distribute the lines of current flow may be illustrated by a highly idealized numerical case in which the battery supplies 6 volts, the resistance of the solution is 1 ohm, the equilibrium potential difference between the anode and cathode is zero, as are the polarizations. For such a case the current, by Ohm's Law, is equal to 6 amperes as shown in Figure 5A. Now consider the same setup except that the sum of the anode and cathode polarization is 4 volts. Since the polarization potential acts as a "back potential," the voltage available for driving current through the cell is the 6 volts supplied by the battery less the 4 volts of "back potential." Clearly, only 2 amperes will flow through the system, as shown in Figure 5B. In other words, polarization causes a 67% decrease of current. A more complete discussion of this phenomenon is given by Ferguson and Bandes (10).

The argument may be extended by considering an irregularly shaped cathode whose surfaces are at different distances from the anode. Those surfaces which lie closer to the anode will receive an initially higher current density than those surfaces further away. Thus in Figure 6A, surface "a" is half as far from the anode as is surface "b," in the absence of polarization and any equilibrium potential difference between the anode and cathode, twice as much current (6 amperes) will

* Many mathematical expressions have been given to equate polarization with current density; their consideration is beyond the scope of this discussion.

flow between the anode and surface "a" as between the anode and surface "b" (3 amperes). Now consider the case where the initial current of 6 amperes produces a "back potential" of 4 volts, while the 3 ampere initial current produces a back potential of 2 volts. Then, as shown in Figure 6B, the current flowing between the anode and surface "a" after equilibrium has been established is identical with the current flowing between the anode and surface "b." Clearly, the polarization due to the initial high current has resulted in a redistribution and an equalization of currents. The foregoing numerical example is, of course, highly idealized, and the influence of polarization on current distribution, and hence on metal distribution, is exaggerated.

A second factor which influences throwing power is the change of current efficiency with current density. Consider the case illustrated in Figure 7. Three amperes will flow between area "a" and the anode while two amperes will flow between area "b" and the anode. If, however, the current efficiency at area "a" (3 amperes) is 50%, while at area "b" (2 amperes) it is 100%, only 1.5 amperes will be used to deposit metal at area "a" while the full 2 amperes will deposit metal at area "b." *In this purely hypothetical case the recessed area "b" will receive 33% more deposit than area "a" closer to the anode.*

The question now arises—why should current efficiency vary with current density? The answer has already been given in the statement, "The deposition potential E_d, at a given current density, is the sum of the polarization potential E_p, and the equilibrium potential, E_s". Since the polarization potential is a function of the current density, all other factors held constant, the current density will determine the potential at which deposition takes place.

Implicit in the numerical example just given (see Figure 7) is the fact that the polarization of the metal increased more rapidly with current density than did the hydrogen polarization. Consequently, at a high current density less energy was required to liberate hydrogen than to deposit the metal, and current efficiency *decreased* with increasing current density. If the converse were true, i.e., the hydrogen polarization increased more rapidly with current density than did the metal polarization, the current efficiency would *increase* with increasing current density.

Clearly then, polarization affects throwing power in three ways:

(a) redistributing the current, as shown in Figures 5 and 6,

(b) causing current efficiency to vary with current density,

(c) a complex addition of the two previous factors.

In the writer's opinion, attempts to put the concept of throwing power on a quantitative basis are doomed to failure until reliable data are available concerning the variations of current efficiency and polarization with current density. Further, any one empirical geometry, empirically used to evaluate the relative throwing powers of a series of solutions, will not necessarily yield results consistent with those obtained with any other empirical geometry.

Anodic Phenomena

In most of the preceding discussion attention has been focused on the cathode. Anodic processes, too, are influenced by polarization, although often they are further complicated by the formation of films of many types. In general, however, the phenomena which occur at the anode are subject to analysis in terms of polarization if it is remembered that, because of polarization, the anode becomes more noble.

Summary

Factors such as current efficiency, alloy deposition, structure of deposits and throwing power have been discussed and the significance of polarization with respect to all of them has been emphasized. In the author's opinion, precise polarization data will be required if many of the unknowns of the art of electroplating are to be understood.

Bibliography

1. Latimer, W. M., *Oxidation Potentials*, pp. 294-297. New York, Prentice Hall, Inc. (1937).

2. Macnaugtan, D. J. and Hammond, R. A. F., *Trans. Faraday Soc.*, **27**, 633 (1931).

3. Glasstone, S., *The Electrochemistry of Solutions*, p. 399. New York, D. Van Nostrand (1930).

   Thon, N., *L'Electrolyse at la Polarisation Electrolytique*, pp. 17-20, Paris, Hermann et Cie (1934).

4. Faust, C. L., *Modern Electroplating*, pp. 59-82. New York, The Electrochemical Society (1942).

5. Blum, W., Beckmann, A. O. and Meyer, W. R., *Modern Electroplating*, p. 54. New York, The Electrochemical Society (1942).

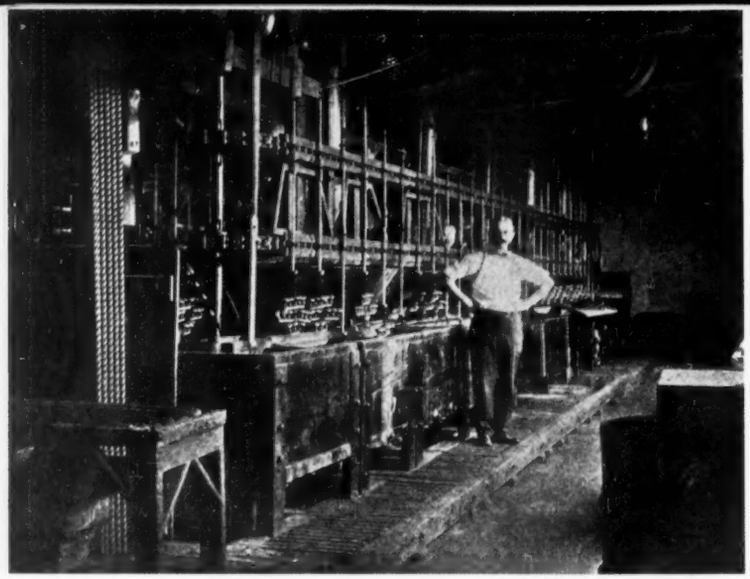
6. Weisberg, L., *Alexander's Colloid Chemistry*, Vol. VI, pp. 579-584 (1946).

7. Henricks, J. A., *Trans. Electrochem. Soc.*, **82**, 123 (1942).

8. Brenner, A., Proc. *American Electroplaters' Soc.*, **29**, 28 (1941).

9. Graham, A. K. and Read, H. J., *Trans. Electrochem. Soc.*, **78**, 279 (1940),**80**, 329 (1941).

10. Ferguson, A. L. and Bandes, H., *Trans. Electrochem. Soc.*, **81**, 273 (1942).



Automatic plating machine of the late 1900's.
Foreman plater Hugh Kelly in evidence.

All Our Yesterdays

PART V

By George Spelvin

IF YOU had been the editor of a metal-finishing magazine in 1907, you would have had at least one problem in common with your counterpart of today: you would have been under compulsion to write a lead editorial for the January number reviewing the progress made in the art of electroplating during the preceding year—in this case, 1906. Accordingly, we can begin our gleanings from the files for 1907 in fitting manner by quoting from just such an editorial: "The past year has increased our knowledge of the art of electroplating, already much too meagre. The rule of thumb plater is certainly doomed to pass out of existence. The day has gone when one can expect to obtain good results in plating without the use of a voltmeter or by not carefully attending to his solutions. A few platers are left who pride themselves that they have never used a voltmeter or hydrometer but it is pleasing to realize that they are rapidly passing out of existence . . . During the year 1906 the plating barrel has become more widely used than ever before . . . The condition of the nickel anode industry has remained practically the same as in previous years. It has been demonstrated that an alloyed anode is best . . . The use of boracic acid has gone beyond the experimental stage and is now accepted as standard practice . . . In silver plating no change has been made . . . Electrogalvanizing has become a standard practice and has proven well suited for many classes of work. The fear of the hot galvanizer that his business would be taken from him has not been realized as both kinds have a field of their own . . . Never in the history of the art of metal decoration have so many varieties of finishes been in vogue as at the present time. Royal copper is re-appearing; the various verdes . . . are in great demand . . . Genuine French bronze . . . French gray . . . gun metal . . . ormulu-gold . . ."

The modern electroplater of 1907 read in his newspapers that a large oil company had been indicted on 939 counts for accepting illegal rebates from the railroads; another oil company was found guilty on 1463 counts of a similar charge; railroads south and west of Chicago were strike-bound; shipbuilders, longshoremen, brewery workers were out on the picket line, and there was a general strike in Birmingham, Ala. The labor front was sufficiently active to be noticed in the technical press: one editor consoled himself with this thought: "Labor unions seem to be even stronger in Germany than here. It is some small comfort, at any rate, to see that labor troubles are not confined to America."

The Noble Experiment cast a long anticipatory shadow as Delaware and Colorado adopted local option and Georgia went officially dry; the stock market broke sharply early in March—it was a bad year financially, although such modern euphemisms as "recession" and "shakeout" hadn't been thought of.

But let's return to the trade journals. An article headed "Plating Without a Plating Bath" describes a new patent mixture of 3.5 parts powdered tin, 4.5 parts powdered lead, and 8 parts mercury. This mixture is triturated in a mortar, and 16 parts of the resulting amalgam are mixed with 3.5 parts of sal ammoniac. The final mixture is then rubbed over the surface to be "plated."

For neither the first nor the last time, there were reports of extensive commercial tin deposits on the North American continent: "Every consumer of tin will be glad to learn that there is a prospect of tin being produced in Alaska in commercial quantities. Metallurgists who have examined ore from that country report that it contains 30% and will concentrate to 70% tin. The ores were also free from iron. The Bartela Tin Mining Co. has made an initial shipment of ten tons of Alaska tin and claims to have enough ore in sight to keep a modern quadruple discharge mill busy."

An editorial on the hazards of polishing and buffing cites the fact that the death rate among polishers is high, the leading causes being tuberculosis, suicide and accident, in that order. Better ventilation and removal of dust are recommended, though the interesting question of why polishers commit suicide is not examined.

"The Hurtful Effect of Over-Concentration in Plating Baths" is the title of a feature article, which says: "Over-concentration is the direct cause of much of the difficulty the plater encounters. This is particularly true at this time of year [May] when solutions are worked at the prevailing temperature of the atmosphere . . . How many platers consider the fact that with a variation of temperature comes a variation in concentration, although the specific gravity or density in degrees may be the same in the winter as in the summer. Concentration would also remain the same if the temperature of the solution was the same equivalent during the two seasons of the year." (Shall we go over that again?) "Also with cold working solutions we find in the winter time

crystalline deposits which are made up in their structure with minute globules of metal which seem to have jumped upon each other, instead of the smooth and natural deposit that should result under normal conditions . . . In the summer time we find the trouble is reversed . . . The increase in temperature as summer comes on means an increase in activity of the bath. The influence of temperature upon the concentration of the various electrodepositing solutions will be found to be the real or indirect cause of many of the troubles that the plater is heir to in the course of his daily operations."

A nice moral question would seem to be posed by the announcement of a new "silver" plating process. This interesting development was covered by both leading journals of the finishing trades, though with somewhat different emphasis. Journal A: "By the utilization of a patent process of electroplating, John Blank announces that he is able to reduce the cost of silver plating from 50-75% . . . The inventors and owners sell the shop rights for using it and announce that infringements or any attempts to use the process without authority of the owners will be promptly dealt with according to law. Samples of the work will be sent upon request and correspondence is solicited . . . The patent is issued on an electric plating solution containing silver or nickel or a metal of the nickel group. The inventors have thoroughly tested it and sold thousands of dollars' worth of goods plated from the solution. They say the lustre is bright and does not tarnish readily. The plate resembles silver to such an extent that it is difficult to distinguish between this new plate and that of pure silver. The owners report that they sell the compound and shop rights for a very reasonable charge."

With less stress on threats of lawsuits, Journal B: "For many years attempts have been made to cheapen the operation of silver-plating but with no success. It may be said that the process is practically the same today as it was at the time of Roseleur, fifty years ago. Various attempts have been made to deposit another metal along with the silver so as to form an alloy but this has not, up to this time, been a success. At one time cadmium held out some promise . . . The use of nickel in a silver plating solution has been perfected. The silver-nickel deposit is not only cheaper than pure silver but harder and of better lustre . . . The process has been patented and has been in use for some time by the Blank Co. John Blank, president of the company, says 'We have sold thousands of dollars' worth of goods plated in this improved solution at the same price as goods plated with pure silver and the purchasers have never discovered the difference. Our plating room expenses have been reduced 75%.'" Apparently, what the customer doesn't know won't hurt him.

A glimpse of the state of science reporting in the daily press in the days before science constituted important news is afforded by an editor's complaint, which we feel was uttered from the depths of his soul: "There is one indictment to which the daily press of this city [New York] practically without exception must plead guilty. They are gullible when it comes to scientific or engineering subjects, no matter what branch of engineering may be under consideration. The inaccuracy with which they treat a technical question is proverbial. Anyone will do to report an engineering convention or the opening of a power station; but only an expert must be assigned the task of describing a bride's trousseau or attend a fisticuff exhibition."

An idea of first importance to platers had taken sufficiently definite shape for publication: "To The Platers and Polishers of the United States: Greeting. It is with pleasure that I take this opportunity, through the courtesy of *The Metal Industry*, of introducing myself to the platers and polishers of the United States and Canada." The idea of an association of platers and polishers is then put forward, and the call to action—too long to quote in full—ends with a plea for all interested parties to write to the "undersigned" who was, of course, Charles H. Proctor. Nor was the significance of this modest beginning lost on the journal's editor, for he strongly seconded Mr. Proctor: "We print a strong appeal by Charles H. Proctor advocating the formation of a society or association of platers and polishers, who are now isolated; they have nothing of common interest on the practical side of their calling; each man works in his own little sphere, learns nothing from his neighbors and imparts no knowledge himself. We believe that among the 30,000 platers and polishers in the United States and Canada there are certainly a sufficient number to form a strong association. Each has now the opportunity to cast off the 'verde' and the 'antique' and to assume the 'royal' finish."

On the national scene, meanwhile, a large share of the news continued to be of oil companies and railroads, as the dynamic occupant of the White House brandished his big stick. Oil Company fined $1,623,900; two Railroads fined $20,000 each. Of particular interest was a fine of no less than $29,000,000 assessed against an oil trust by a certain judge Kenesaw Mountain Landis, later well-known to baseball fans. It must be recorded, too, that his decision was reversed in a higher court. On September 2 the new superliner *Lusitania*—nor would this be her last appearance in the headlines—arrived in New York on her maiden voyage, her trip from Queenstown in 5 days 54 minutes breaking all records.

The new ship was of interest to metal finishers and was duly noted in the journals. An article described her art metal work in some detail, and remarked: "The maiden voyage of the *Lusitania* has stirred excitement on two continents, because, in respect of speed, modern equipment, gigantic size, and luxurious furnishing, it is conceded to represent the high-water mark of British achievement."

A very real service to platers was being performed monthly by the journals through their question and answer departments. By far the great majority of inquiries were routine requests for recipes and recitation of troubles, and need not detain us. Here are a few, though, which seem to throw some light on the state of the art and which therefore deserve quotation.

Q.: What difference does it make from an electrical and chemical standpoint whether in arranging the wires for a plating tank the rheostat is placed in the negative or cathode wire or in the positive or anode wire? I notice most all works on that interesting subject advocate placing the rheostat in series on the cathode side, while a number of platers do the opposite. I am of the opinion there must be a reason for it but if there is not why do certain authors and dealers advise it? A.: Theoretically it makes no difference whether the resistance is placed in circuit with the plus or minus connecting wires: some operators use one way and some the other. Practically the resistance placed in circuit with the anode wire gives the best results as the current passing through the anodes has a tendency to offer a greater resis-

tance to excess of current produced when other baths are in the circuit. This is especially noticeable when the articles are being removed from more than one bath at a time and often saves burning or too rapid a deposition. This is most noticeable in nickel and silver solutions.

Q.: Can graphite be dissolved in anything? I have a plating formula for a black finish and one of the ingredients is powdered graphite. This is added to the plating solution. A.: Your formula is worthless; there is no known solvent for graphite.

Q.: I have a brass solution for which I have no further use. Is it possible to remove the zinc and produce a copper solution A.: It would cost more than the solution is worth. You will have to throw the solution away and make a new one which contains only copper.

Q.: Can steel wire be made impervious to rust by giving it successive deposits of copper, nickel, and zinc, A.: We fail to see what you will gain. All you need is a good heavy deposit of one metal: zinc is the best protection for steel.

The lack of facilities for analytical control shows through the answer to this: Q.: Will a solution and anodes half of silver, half of cadmium give a good deposit and can it be used in place of silver? A.: Such a solution has been tried but it is almost impossible to control and maintain since silver and cadmium are the same color.

Q.: We would like to know how to make double nickel salts out of old nickel anodes. A.: The manufacture of nickel salts is essentially a chemical process and while by following the formula you may be able to produce satisfactory salts we are of the opinion that if you would use your scrap anodes in the following manner you would obtain more satisfaction. Procure iron rods 3/8 to 1/4 inch in diameter and bend one end in the shape of a pothook. Cut a thread on the other end and use a regular nut. Now take your scrap anodes and drill holes in the center to fit the rods. Place as many pieces as you can on the rods and use them as anodes. Cover the exposed part of the rod and the nut with asphaltum varnish as this will prevent the solution from acting on the iron. This anode will be as good as new ones.

But in spite of the foregoing advice, the very next issue of the same journal carried a note on how to make double nickel salts out of old anodes.

Q.: (1) I am going to make a new nickel solution, 175 gallons, and do not want to use distilled water on account of the cost. Will city water do? (2) How thin can an anode be used before being sold for scrap? (3) I have no means of keeping my solution warm and crystals form on the anodes. I put a large dishpan (enameled) full of solution on the stove and heat it; this is then put back in the tank: the crystals then disappear. A.: (1) The old theory that distilled water must be used for plating baths is erroneous. The slight impurity in most water is not detrimental to plating operations so you can safely use city water in your bath. (2) Nickel anodes can be used as long as they will hold together. When they fall apart the pieces can be connected together with iron wire and give good results. Do not use any wire except iron: copper or brass will discolor your deposit, while iron wire improves it. (3) Your method is satisfactory as long as you have no other means of keeping your bath at the right temperature.

The editors were not infallible, particularly when theoretical questions arose. For instance Q.: What phenomena (*sic*) takes place during the process of chemical tinning? We use a saturated solution of cream of tartar and place the work in contact with tin electrodes and boil for twenty or thirty minutes. What causes the deposition of tin? A.: Without going into the chemical symbols, which are somewhat complicated with inorganic (*sic*) acids or salts such as the cream of tartar, the theory is that the free tartaric acid in the free cream of tartar dissolves the tin, forming tin tartrate; but that copper having a greater affinity for this acid immediately, on coming in contact with the tin tartrate, exchanges places with the tin; that is, the copper leaves the copper or brass article in the solution and the tin takes its place, but in so doing leaves some free acid which in turn dissolves more tin from the tin electrodes (so-called) in the solution. In course of time the solution becomes so saturated with copper as to refuse to work until more cream of tartar is added. (*Aren't you glad you asked?*)

Occasionally a note of sarcasm found its way into the editors' replies. Q.: We have been informed that the addition of a small quantity of gold solution will improve a bronze solution. Can you inform us? A.: We shall have to admit our ignorance on this point. We have never heard of adding gold to a bronze solution. Why don't you try it? In bronze-plating cheap steel hardware you will soon discover its cost. There are many beautiful finishes that may be obtained by the use of gold and you yourself can decide whether they can be used in plating cheap hardware. You need not advise us of your result. We can anticipate it.

More typical of the general run of questions and answers were: Q.: My nickel solution is not working right; the work is coming out hard, rough and dark colored. Blue litmus paper shows plenty of free acid. I put in liquid ammonia (*sic*) and am afraid I put in too much. The color of the solution has changed from green to blue and the plate is softer. The hydrometer stands at 6½. (2) I notice some of my anodes are black and soft and a yellow sediment collects on them. Should this be scraped off? A.: (1) In the first instance your nickel solution needed metal. If you had added 2 oz. of single sulphate of nickel to each gallon of solution the metal content would have been reimbursed and the trouble you relate would not have occurred. The addition of ammonia is a frequent cause of trouble to nickel platers. As long as the nickel solution conducts freely, single sulphate of nickel is preferable as it gives you the metal needed. Only when the solution shows dark streaks or shadows is it necessary to add conducting salts, and then a little common salt will answer the purpose. If your solution does not work properly reduce it to 5 degrees Baumé and then add 2 oz. single sulphate of nickel to each gallon. This will change the color and should give a normal bath. (2) You should occasionally boil your anodes and scrape them; this gives your solution a chance to reduce the metal properly.

Q.: I have a dispute which you can settle. What is needed in the solution when the anodes turn black and the work at times is streaked? Does the silver solution need the addition of metal in chloride form or can it be fed entirely from the anodes? I am only able to suspend about 20% anode surface and am plating with 2.5-3 volts. Does that take metal from the solution faster on that account? My disputant claims that the anodes in all solutions should feed them. A.: Silver baths cannot be maintained in operation with the aid of cyanide of potash only. Your solution is evidently too low in metal and with only 1/5 of anode surface to 4/5 of cathode

(*Concluded on page* 528)

Plating with Gold

By H. M. HABERMAN

New York, N. Y.

THE ability of gold to resist corrosion and tarnish oxidation at high temperatures and the fact that it is almost completely impervious to chemical attack, makes it ideally suited for laboratory apparatus, electrical contacts and cavity resonators in radio, pen points, and reflectors in infrared radiation equipment. For the same reasons and also because it is highly ornamental, its use in tableware, musical instruments, and jewelry is widespread. For most applications, the softness of pure gold coupled with its prohibitive cost, makes its use impractical. But both these objections can be overcome by coating a harder and cheaper metal with a thin film of gold by means of plating. By the proper use of plating a coating as thin as one millionth of an inch or less may be applied, thus permitting a small quantity of gold to go an extremely long way, and off-setting, to an extent, its high cost, while still giving the finished work the qualities of durability and beauty so highly prized.

Four methods of plating with gold may be found in the literature, and it is the purpose of this article to explain all of these methods in detail, including the common processes for obtaining the various hues, such as red, green and white. All of the methods, with the exception of mercurial gilding, which will be considered first, are fundamentally processes involving electrochemical action, despite the fact that an external source of electricity is applied in only one of the methods. This electrochemical action results from the fact that gold occupies a position very low in the electromotive force series and is therefore readily replaced in its salts by metals occupying a higher position.

Mercurial Gilding

The oldest process is known as mercurial gilding. This is the most uneconomical of the processes so far as time is concerned because it is necessary to go over the work several times, inasmuch as the first coats are absorbed by the surface. However, both the thickness of the film and its color can be controlled; this fact is probably the one important advantage of the method, permitting as it does the creation of individualized artistic effects.

The procedure is as follows:

(a) Pure gold in thin sheets is cut into small pieces and heated to about 115° F. To this is added mercury weighing half as much as the gold, the excess mercury being squeezed out through a chamois and saved for later use, since it will contain some gold. The amalgam should be kept under water while not in use.
(b) The work is cleaned thoroughly by washing with dilute nitric acid.
(c) A solution of mercuric nitrate is applied with a wire brush.
(d) The amalgam prepared in step (a) is applied with a wire brush.
(e) The work is scratch brushed and the thickness of gold increased by repeating steps (c) and (d).
(f) The work is rinsed thoroughly in clean water.
(g) The work is gently heated to a temperature above 390° C. or 734° F., when the mercury volatilizes, leaving the coating of pale yellow gold.
(h) If it is desired to improve the color, a paste is made up of equal quantities of aluminum potassium sulphate and sodium nitrate and the work passed through it.
(i) The work is now dried and the application of heat continued until the salts just fuse.
(j) The salts are cleaned off by rinsing in cold water.
(k) A final hot rinse is given.
(l) If further improvement in color is desired, the entire process, starting with (h) may be repeated.

Adequate ventilation must be provided when using this method to insure against inhaling the poisonous fumes.

Immersion Method

A somewhat simpler procedure than the foregoing is offered by the immersion method. This method, as the name implies, involves nothing more than immersion of the work to be plated in a suitable bath, without the use of electrodes or external current, and simply allowing it to remain submerged until the gold transfers from the solution to the material to be plated. This method is essentially one of electroplating, the electrochemical action resulting from the proximity in the same electrolyte of two dissimilar metals, the basis metal and the plating metal, occupying different positions in the electromotive force series. Only a thin coating of gold is possible with this method, because as soon as the gold film is deposited on the work there is no longer a dissimilar metal in contact with the gold in solution and the electrochemical action comes to a halt. But even though the coating is thin, it is of high specific gravity and therefore of good quality. The method does have the advantage of simplicity and resultant low cost. For satisfactory results, the work should be of copper or brass and should not be too large in size.

The plating solution is made up by first mixing the following ingredients:

Sodium cyanide	4 ozs.
Sodium carbonate	5 "
Water to make	1 gal.

To this solution is added up to one-half ounce of fine gold in the form of gold fulminate, the preparation of which will be described in complete detail under the electrogilding method a little later. The fulminate is washed into the above solution and the whole is heated until it is dissolved.

Preparation of the gold salt involves certain hazards,

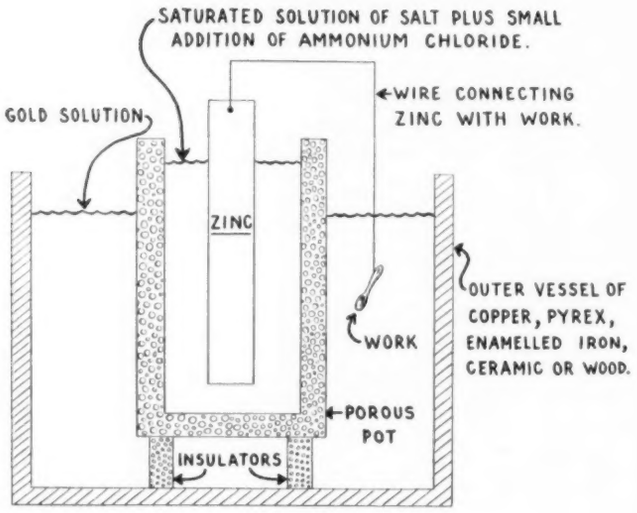


Fig. 1

among which may be mentioned the generation of noxious fumes which are dangerous to personnel, occasional cracking of the mixing vessel, and the loss of gold. Because of these hazards, it is probably wiser to start with a commercially prepared gold salt. To make up such an immersion plating bath the following alternative formula is offered:

Gold as potassium gold cyanide	½ ozs.
Potassium cyanide	5 "
Potassium carbonate	6 "
Water to make	1 gal.

Either of the solutions described above is placed in a clean jar or crock and the whole is then stood in a water bath and heated to a temperature of around 180° F, this temperature being maintained all during the course of the plating process.

The work should be thoroughly cleaned before immersing in the plating bath, first by cleaning in the usual manner, then by rinsing in clean water, and finally by dipping in a solution of eight ounces of potassium cyanide in a gallon of water.

Single Cell or Salt Water Method

This method, like the immersion method, requires no external source of electricity, and is almost as simple as the latter. The coating obtained with this technique is very uniform in thickness and color and will stand up adequately under moderate service. The length of time necessary to obtain a satisfactory coating may range anywhere from fifteen minutes to several hours.

If gold fulminate is to be prepared (see method of preparation under section on electrogilding), the solution described below should be used:

Sodium ferrocyanide	3½ ozs.
Sodium phosphate	1⅔ "
Sodium sulphite	1/12 "
Water to make	1 gal.

To the above, the gold fulminate is added in sufficient quantity to make the gold content of the solution about three or four dwt. per gallon. The solution is then boiled for thirty minutes and filtered and any residue discarded as useless.

Two containers are required, one large enough to hold the plating solution and a smaller porous one which is partly submerged in the gold solution. The larger vessel is usually made of copper, although enamelled iron, pyrex and ceramic ware can be used. The porous pot is filled with a saturated salt solution to which has been added a small quantity of ammonium chloride, and in this saline solution a zinc electrode is suspended. The entire pot, with its contents is now set on insulators in the gold solution in the larger vessel and a copper wire is connected securely to the zinc electrode and run to the work to be plated, which is then suspended in the gold solution. The cross-sectional drawing of Figure 1 illustrates the arrangement.

There are numerous variations of this basic arrangement and a common one is illustrated in Figures 2 and 3. Figure 2 is a cross-sectional view and Figure 3 a plan view. It will be observed in this arrangement that the solutions have been interchanged, the gold solution now being in the porous pot and the saline solution in the larger vessel, and that the zinc electrode is now in the shape of a circular tube surrounding the porous pot.

For best results, the solution should be maintained at a temperature of about 158° F., and as the gold is used up it should be replenished by the addition of more gold fulminate.

This arrangement constitutes a voltaic cell or battery, with the zinc serving as the anode. A difference of potential exists between the zinc and the work being plated, and as the zinc passes anodically into the salt solution, the gold is deposited on the work.

If it is preferred to work with a commercially prepared gold salt instead of the pure gold, the following formula may be used :

Gold chloride	6 dwt.
Potassium ferrocyanide	2 ozs.
Disodium phosphate	1 "
Sodium carbonate	½ "
Sodium thiosulphate	.02 "
Water to make	1 gal.
Operating temperature	158°F.

The mixture is boiled for about thirty minutes, filtered and any residue discarded as in the first formula, and then used exactly in the same manner as the first formula, operating at the same temperature.

Electrogilding Method

The final, and most common process to be described is the electrogilding method employing an external source of electricity. This process permits the maximum amount of control both as to thickness and color, and where work is to be done in any quantity, this is unquestionably the process to be used.

The first step in the process is the preparation of the gold salt from the pure gold. The procedure to be outlined now should be followed in making up the gold salt not only for the electrogilding method but for the immersion and salt water methods as well. The pure gold is cut up into small pieces and digested in aqua regia, which is a mixture of three parts of strong hydrochloric acid to one part of nitric acid. It is recommended that the process be started with the hydrochloric acid to which the nitric acid is then added in small quantities occasionally as needed. Poisonous nitric oxide fumes are given off during this process, and care must be exercised to see that the fumes are drawn off by a proper system of ventilation and not inhaled. After the gold has

been dissolved, the solution is heated until the liquid is syrupy; overheating will cause the gold chloride to break down. The gold chloride is then redissolved in a small quantity of water and the water evaporated by heating. After the pure gold chloride has been obtained, one of the two following procedures is used: (1) To the gold chloride a quantity of ammonia is added to obtain the yellowish-brown gold fulminate as a precipitate, just enough ammonia being used to obtain a barely alkaline reaction with litmus. The residue is filtered and washed without allowing the drying to proceed too far because gold fulminate is highly explosive when dry. So long as the drying is not carried too far there is no danger. A solution of potassium or sodium cyanide is now made and the gold fulminate washed into it, after which the mixture is boiled until the last of the ammonia has been driven off as evidenced by the disappearance of the ammonia odor. The alternative procedure (2) is to prepare a double cyanide by adding the gold chloride directly to a cyanide solution. This method will introduce a small amount of alkali chloride into the plating bath, but the amount is so small as not to be detrimental. The solution is then boiled for a short period, as in the first case, and is ready to use.

The proportions of the plating mixture are as follows:

Gold	½ ozs.
Sodium or potassium cyanide	3 "
Water to make	1 gal.
Temperature	120° to 160° F.
Current density	1 to 5 amps./sq. ft.
Voltage	2 to 5 volts.

Sodium phosphate and a reducing agent are commonly added to this solution to increase the density of the deposit. The solution should always be used fresh as it deteriorates on standing and will then no longer give a bright color. When the solution has become old it is best to reclaim the gold and make up a fresh batch.

The following is an alternative formula utilizing a commercially prepared gold salt:

Potassium gold cyanide	½ ozs.
Potassium carbonate	1 "
Potassium cyanide	½ "

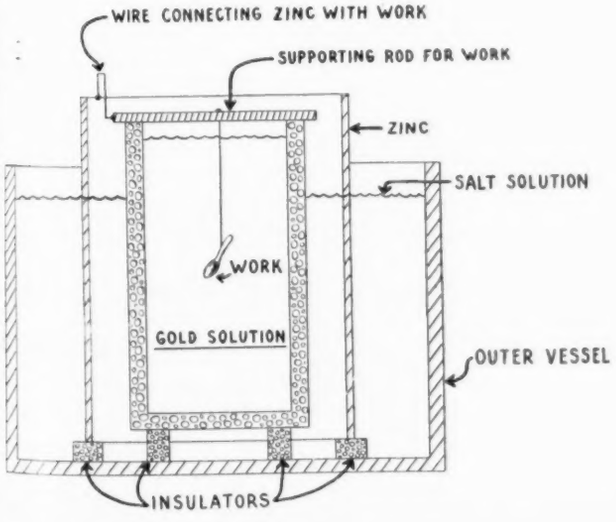


Fig. 2

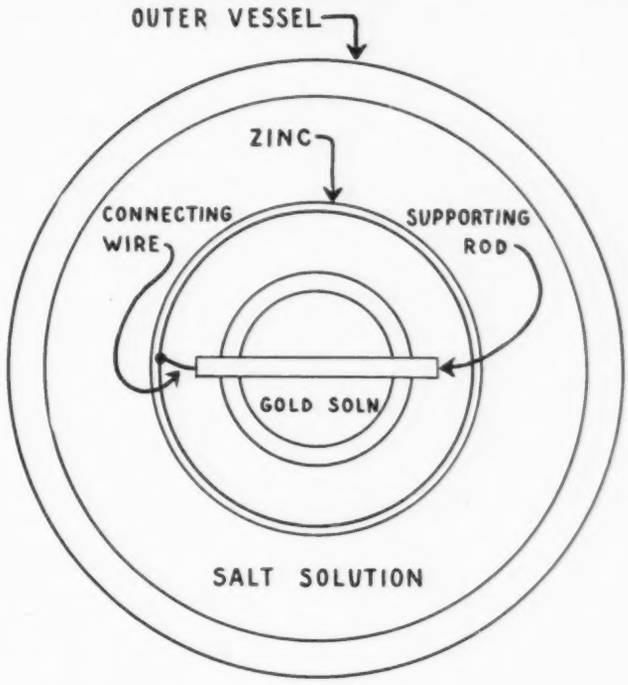


Fig. 3

Water to make	1 gal.
Temperature	120° to 160° F.
Current density	5 to 15 amps./sq. ft.
Voltage	2 to 5 volts.

The thickness and the color of the plating are controlled mainly by the current density and the temperature of the bath. The kind of metal to which the plating is applied also affects the color, particularly if the coating is thin. Although the current density should not be too high (between one and five amperes per square foot being general), on the other hand too low a current results in a pale, unattractive color. Too low a temperature will also produce a similarly unattractive color. Normal working temperature should lie between 105° F and 175° F. In general, the higher the temperature and the higher the current density, the warmer and darker the color becomes; the lower the temperature and current density, the lighter the color. The operating voltage should lie between two and five volts; if the latter voltage is exceeded there is a danger that the deposit will be uneven.

A gold anode is desirable, but should not be left in the solution except during use. Since the anode efficiency is greater than that of the cathode, the solution has a tendency to grow stronger in gold content during use. To overcome this tendency an insoluble anode such as platinum, stainless steel, nichrome, or hard carbon is often used.

Five to ten seconds of operation will normally result in a good coating on copper, brass, nickel or silver. When steel is to be gold-plated, it is usually plated first with one of the aforementioned metals before the gold is applied, although several solutions have been patented which permit the direct application of gold to steel and stainless steel.

Colored Gold

The addition to the plating solution of certain metal salts will change the color of the coating to produce the various well-known gold hues. Since the shades obtainable are num-

berless, only an indication of the quantities to be added can be given; exact quantities will depend on the particular shade desired and can be readily determined by experiment. The following information may be used as a guide, however:

Red or pink gold is obtained by the addition of copper cyanide. The quantity to be added will range from 5% of the gold salt to 50%. The working temperature should be between 120° F and 150° F, the current density between 10 and 15 amperes per square foot at three volts. Constancy of color may be procured by placing a small copper electrode alongside the gold or insoluble anode.

Green gold is obtained by the addition of sodium silver cyanide or cadmium oxide in quantities ranging from 10% to 50% of the gold salt. The usual working temperature is 100° to 120° F., with current densities of 10 to 20 amperes per square foot at two volts.

White gold is obtained by the addition of nickel in the form of double cyanide in a quantity about equal to the quantity of gold salt. The working temperature ranges between 120° and 130° F., with current densities between 20 and 40 amperes per square foot at 6 to 10 volts.

Antique effects, finally, may be obtained by introducing into either the regular bath or the green gold bath a small quantity of lead salt, which will result in the deposit of a black smut. The work may then be scratch brushed or given a hand or wheel rubbing with sodium bicarbonate or pumice to achieve the desired effect. If deemed necessary, the work may be completed with a final flash plating of pure gold.

Conserving Gold

In all operations involving the use of gold, great care should be exercised to prevent the loss of gold. The first rinsing water should always be saved and later used in making up the plating bath. If gold deposits are to be removed from an article, the job may readily be done by setting up the work as the anode and using a small iron cathode in a bath consisting of a 5% solution of sodium cyanide. However, this procedure entails the danger of putting into the solution not only the gold, but some of the basis metal along with other impurities.

Plating Equipment

A small experimental unit for plating with gold may be set up by utilizing a storage battery, a voltmeter, an adequate rheostat and a few crocks, but for an economical, commercial arrangement, it would be wise to consult the suppliers of electroplating equipment.

Bibliography

Plating and Finishing Guidebook, New York, (1941), (1945).

Metal Industry, New York, **36**, 279 (1938); **37**, 72 (1939); **38**, 132 (1940).

Samuel Field and A. D. Weill, *Electro-Plating*. Pitman Publishing Corp., New York City (1945).

Modern Electroplating. *Trans. Electrochem. Soc.* (1942).

J. Roslyn, *Electro-plating and Anodising*. G. Newnes, Ltd., London (1941).

Platers Handbook. R. Cruickshank, Ltd., Birmingham (1940).

Practical Handbook on Electroplating. W. Canning & Co., Birmingham (1928).

Blum and Hogaboom, *Principles of Electroplating and Electroforming*. McGraw-Hill Book Co., New York (1930).

F. C. Frary, *Trans. Electrochem. Soc.*, **33**, 25 (1913).

ALL OUR YESTERDAYS

(*Concluded from page* 524)

surface is being constantly robbed of its metal, which is necessary for good results. It is essential to feed all solutions with metallic salts with probably one exception, that is a gold solution, and then only when pure gold is used as anode. Black anodes result also from impure silver; some producers guarantee their anodes from turning black.

An unusual sort of difficulty troubled one correspondent. Q.: Our gold solution worked well until one of our workmen attempted to plate a ladies' comb in it. The comb was made of celluloid with a metal back. The solution was used hot and when the comb was removed it smelled very strongly of camphor, and we have not been able since that time to obtain a good gold deposit from it. Can the solution be purified? The editor frankly admitted being stumped by that one.

There were the usual number of hopeless queries on how to plate aluminum; and one plater complained that his silver solution was alkali, and wanted to know how to make it *natural*.

One function of a trade journal is to report progress in its field; another is actively to assist that progress by exhorting its readers to improve their every-day practice. We have seen, in previous articles, how the plating journals editorialized on the subject of instrumentation in the shop, and deprecated rule-of-thumb methods of control. 1907 saw no slackening of this campaign, and though extensive quotation would be tiresome, we like the pithy statement that "Electroplating without a voltmeter is like steering a ship without a compass." An article on "The Neglected Ammeter" said that "To the average plater the use of the ammeter, in its broadest sense appears too intricate for him to follow, as the text books, in dealing with this subject, convey the information in language beyond his comprehension." If the plater relies on the voltmeter alone, the weight of deposit will vary as the solution composition varies, and the article cites some horrible examples.

There was progress to report, also. It has been known for some time, says an article, that faster plating may be had if the solution is agitated; but that has been impractical up to now because of the stirring up of sediment. One company has now taken the bull by the horns and has begun agitating their nickel bath; and to keep it free of sediment they filter it as often as once a week! This is not enough for one correspondent, who writes in to suggest continuous filtration, using a mechanical pump similar to a beer pump. (We can guess where he was when the idea struck!)

Filtration of any kind, not to speak of once a week, was by no means standard practice if we may judge by this helpul hint: "One of the common faults in running an acid copper (sour-copper) solution is to allow it to become full of foreign matter. Dust, dirt of all kinds, and sediment from the anodes float around in the solution and settle upon the articles that are being plated. Wart-like concretions are formed . . ."

Nor must we entirely neglect the advertising columns. A poignant reminder of the days before the word Nazi had been invented is an advertisement for "Swastika" Lacquers: "Swastika, the ancient symbol of good luck, has been adopted by us as a symbol of excellence in lacquers, a hallmark of quality."

See you next year—1908, that is.

Identification of Plated Coatings

By GEORGE BLACK and JACK SINNER

Baltimore, Maryland

Simplification of identification tests on various deposits is proposed. Spot test methods are recommended, thereby reducing elaborate laboratory methods. Charts summarizing the techniques are shown.

THE necessity of being able to identify plated coatings was appreciated long before the beginning of World War II, but the war impetus was certainly responsible for clarifying that need. Scarcities gave rise to hundreds of substitutions, and the host of sub-contractors necessary to keep pace with production demands, led to an unbelievable variety. Today, with manufacturers buying up war surplus, the necessity for positive identification is even more pronounced. It is the purpose of this paper to outline a method of investigation which will tend to eliminate unnecessary testing, and at the same time to include the positive tests for the plated coatings encountered most often.

In many plants, the problem of distinguishing plated coatings is considered a job for the laboratory, but the growing tendency is to develop plating rooms that are independent units, capable of operating with only occasional assistance from the laboratory. In order to make the following information of value to all plating personnel, regardless of available facilities, the individual test procedures for each coating are discussed in sequence, from the most simplified to the relatively complex.

The starting point in the identification of plated coatings is ascertaining that what is being viewed is really the inorganic finish. The surface of the part being tested should be thoroughly cleaned with a suitable organic solvent, and then lightly scratch brushed or scrubbed with a paste of magnesia powder and water, followed by thorough rinsing.

Basically, plated coatings can be divided into two visual groups: those which are white and those which are colored. It is realized that the color of the deposit will afford no positive identification, but generally speaking it will narrow the field of investigation. Let us assume first that the part in question reveals a definite color or tint, and second that our preparation cleaning reveals no organic coating.

From this observation, it is relatively safe to infer that our coating is one of the following:

Brass
Bronze
Cadmium (with after-treatment)
Copper
Gold
Zinc (with after-treatment)

It is a comparatively simple matter to eliminate the cadmium and zinc coatings from this list. Just scratch the coating with a knife or other hardened sharp steel edge. It won't take much scratching to reveal the white coating beneath the after-treatment. Another positive elimination procedure, is to spot the surface with a drop of solution from any alkaline cleaner used for processing steel parts. All the known after-treatments for zinc and cadmium are soluble in strong alkali, thus this method is both simple and reliable. Since our interest at the moment is in colored deposits, let us skip over the zinc and cadmium identification tests, and proceed with our narrowed field.

If the colored coating remains inert after spotting with the alkaline cleaner, it is suggested that the surface be spot tested with nitric acid. Brass, bronze and copper coatings will dissolve readily in nitric, while gold coatings will remain inert. In this way, the gold deposit can be identified with a fair degree of certainty. It is the only colored deposit which is not attacked by nitric acid.

Further differentiation of the colored coatings can be obtained by spotting with hydrochloric acid. Again gold is inert, and copper coatings reveal practically no reaction at all in concentrated acid, whereas both brass and bronze dissolve slowly. Since we eliminated gold by our nitric spot test, we are now able to segregate the copper coating from brass and bronze by its relative lack of reaction in hydrochloric. The copper coating can be positively identified by adding ammonium hydroxide to the nitric acid solution in which it was dissolved. An intensely dark blue opaque color will form if copper is present. Another method for the positive identification of copper is to dissolve the plating in hot concentrated sulfuric acid. If copper is present in the solution, it will plate out on an iron nail or on any piece of clean steel which is immersed in the solution.

The differentiation between brass and bronze coatings can be carried out by a qualitative test for zinc or tin. The tin can be detected as explained below in the test method

TABLE I
Method for the Identification of Colored Deposits

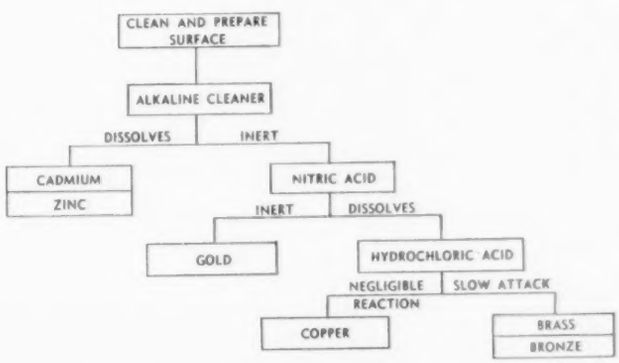
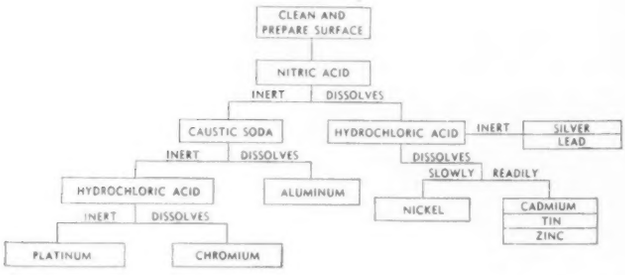


TABLE II

Method for the Identification of White Deposits



for identifying tin coatings, while the zinc can not be detected with certainty unless the solution is first freed of copper. After freeing the solution of copper, zinc can be identified as discussed below under examination of zinc coatings.

It should thus be obvious that colored plated coatings may be identified by means of simple spot testing, plus occasional relatively complex tests for positive identification. Table I outlines the sequence to be followed in identifying colored deposits.

The problem of identifying plated coatings which are white in appearance involves a greater variety of possibilities. Practically all of the plated coatings may be either dull or bright, flat or lusterous depending upon the method of application and the desires of the customer. An ordinary file test is usually reliable for detecting chrome or nickel coatings, as they are so much harder than the others, but even this is not positive and may easily lead to mistaken identification.

Once again we must start out as we did with colored coatings, making certain that no organic finishes are present. When we are sure that the inorganic coating is sufficiently clean and ready to be tested, it is recommended that we spot test with nitric acid. Aluminum, chromium and platinum are the only white coatings which remain inert in nitric acid. All the other common coatings, such as cadmium, lead, nickel, silver, tin and zinc will dissolve.

The identification of aluminum from the first group is accomplished by treating the deposit with a 10% caustic soda solution. Aluminum is the only one of the three which will be attacked. Differentiation of the chromium deposit from the platinum one can be accomplished by scratch testing, as the superior hardness of chromium makes the identification obvious in this case. However, there is a more reliable and just as simple method which is recommended. Simply spot the surface with hydrochloric acid. If the deposit is chrome, it will dissolve to form a dark green solution, whereas, if the coating is platinum it will be unaffected. As a positive identification for chromium the following test is suggested: Dissolve the deposit in hot 1-1 sulfuric acid, dilute with water, heat to boiling and add a small volume of 3% silver nitrate, then several crystals of ammonium persulfate. A bright yellow color in the solution is positive for chromium.

If the plating is insoluble in nitric acid, the next step is to spot test it with hydrochloric acid. Silver and lead will show no reaction with dilute acid at room temperature, nickel will be attacked very slowly, while cadmium, zinc and tin will be readily dissolved. In addition to the following test, lead coatings may be recognized by their dull lusterless soft appearance. Positive identification may be accomplished by adding potassium chromate solution and observing the reaction. If lead is present, a fine, heavy, insoluble, bright yellow precipitate will form. Other tests for lead include: 1) fuming with sulfuric acid to dense white fumes, and observing the heavy, white, insoluble precipitate which will form if lead is present; 2) Adding 10% caustic soda solution to the nitric in which the deposit has been dissolved until the solution is alkaline to litmus. A white precipitate indicates lead.

Nickel may be identified by dissolving in dilute nitric acid, absorbing the solution onto a blotter, and then spotting with a drop of dimethylglyoxime dissolved in alcohol, (1% solution). A bright pink to red color is positive for nickel. The test for silver involves adding dilute hydrochloric acid to a dilute nitric acid solution. A curdy white precipitate forms which turns dark on exposure to bright light. The precipitate is insoluble in water, but readily soluble in ammonium hydroxide or potassium cyanide solutions. Another means of identifying the silver deposit is to make the nitric solution in which it was dissolved alkaline to litmus, by adding sufficient volume of 10% caustic soda solution. A brownish-black precipitate indicates silver.

The three remaining coatings, tin, cadmium and zinc are all soluble in dilute nitric acid as well as in hydrochloric. If tin is dissolved in 1.24 Sp.Gr. nitric acid it will fume copiously and a bulky white precipitate of metastannic acid will form. Tin coatings may be further identified by adding solid cacotheline to the solution formed when the deposit was dissolved in hydrochloric. A reddish-violet color indicates the presence of tin.

The differentiation between cadmium and zinc may be accomplished by making the nitric acid solution in which the deposits were dissolved, alkaline to litmus by additions of concentrated ammonia, and then adding a 10% sodium sulfide solution. A white precipitate indicates zinc, whereas a yellow precipitate indicates the presence of cadmium.

Table II outlines the method to be followed for the identification of white deposits.

These are not the only identification tests available, but it is believed that they are among the simplest ones known. If the procedure outlined in Tables I and II is followed closely, much of the complex chemical testing will be found unnecessary. The materials required by the spot tests are to be found in any plating room, and those required by the more involved test are easily procurable. The following list summarizes the chemicals needed:

Required for simple spot tests:
- Alkaline cleaner
- Nitric Acid
- Hydrochloric Acid
- Caustic Soda

Required for other chemical tests which are described:
- Ammonium hydroxide
- Sulfuric Acid
- Silver nitrate
- Ammonium persulfate
- Potassium chromate
- Dimethylglyoxime
- Cacotheline
- Sodium sulfide
- Alcohol

Improved Chromium Plate

Increased Resistance to Distortion and Impact

By A. L. PEACH

Hard chromium plating for engineering purposes has been a subject of considerable study by the author who has embodied in this article some of the work he has done during the war in the Department of Armament Research. Permission for publication has been granted by the Chief Scientific Officer.

THE use of electrodeposited chromium for repair of worn machine parts or the protection of new components is now recognized as a valuable aid to the engineer. While some of the more optimistic writers claim exceptional advantages in the use of chromium as a protective coating there does not seem to be a consistency in the life that may be expected of treated parts required for some classes of work. A considerable volume of work is "flash" chromium-plated to thicknesses of from 0.00003 in.-0.00006 in. because heavier deposits of the order of 0.001 in. or more, fail to adhere with the base metal sufficiently to resist the effects of "heavy duty" work.

It is the object of this article to pass on observations and measures which provide a more consistent and better chromium-plated job from the engineer's point of view and particularly to describe a method which considerably improves the resistance of hard chrome to the effects of distortion and impact and somewhat increases the field in which thicker deposits may be used. The method is one in which two chromium baths are used to provide a composite deposit comprising a "soft" adherent and impact-absorbing underlayer and a very hard wear-resisting outer layer. The adhesion and potential usefulness of all chromium coatings are considerably influenced by the nature of the base metal and it is proposed to restrict the observations made here as applying to ferrous metals only.

Steels

It is found that plain carbon steels submit the most readily to chromium deposition and provide the best base upon which to obtain a useful degree of adhesion. Steels alloyed with tungsten, molybdenum, chromium, etc., that are required for specialized or heavy duty work are next and cast iron provides the poorest surface condition. It is necessary that all steel work be free from scale and preferably have a smooth bright ground or machined surface because roughness on the base surface causes growths to form in the deposit which are difficult to remove without damaging the chromium. The degree of adhesion between the chromium and the base metal may be improved by selected pre-cleaning treatment including acid etching, but the pre-cleaning does not alter the order of preference as outlined in the above groups. Plain carbon steels and cast iron are usually ready for deposition after pickling, surface smoothing treatment and preferably a very short acid electro-etch at high current density, but the high tensile, stainless and hard cutting steels are better if also heat-treated at 200° C. before cleaning and after deposition to relieve stress. In the case of cutting steels it is often recommended to reduce the hardness to 400-500 V.P.N. in order to provide a necessary base for chromium plate. The adhesion between base metal and electrodeposited hard chromium certainly decreases as the hardness of the steel increases above 500 V.P.N. Lowering the hardness of cutting steels is undesirable and not necessary when using the two-layer process described.

Wear Resistance

The next important influence upon the life of the chromed component is the hardness and wear resistance of the deposit. The structure of the chromium deposit is dependent upon the nature and control of the electrolyte. Chromium plating solutions other than those containing chromic acid and sulphuric acid do exist, but the commonly used bath is that containing basicly 250 gm/l chromic acid and 2.5 gm/l sulphuric acid. The composition of the bath may vary without preventing the reduction of chromium but it is not wise to allow the ratio between the sulphates and chromic acid present in the bath to be greater than 150:1 or less than 70:1. The bath may concentrate by evaporation so as to contain 600 gm/l chromic acid or be diluted so as to contain 150 gm/l. It is, however, better to maintain the bath so that the concentration of chromic acid is between 250-350 gm/l, the sulphate ratio being as near 100:1 as possible. The chromium reduced from this concentration using a cathode current density of 200 amp/ft² at 50-53° C. bath temperature is the hardest type and the combined range of conditions in which it is produced is said to be the "bright chrome range" because the

Reprinted with permission from The Metal Industry, London.

deposits reduced therein have a characteristic high lustre which is indicative of being the hardest type of chromium (900-1,000 V.P.N.). If any one of these conditions is changed, such as say, the temperature is raised to 65° C., the cromium reduced is relatively non-lustrous. Should the temperature fall to, say, 40° C. or less the deposit is again non-lustrous. Similar phenomena are to be observed if the temperature remains constant at 50° C. and the cathode current density is raised to, say, 500 amps/ft² or more. However, it is possible to raise or lower the range in which lustrous hard chromium may be produced as is shown in Fig. 1 by a regulated dual adjustment of temperature and cathode current density.

The shaded area in the graph shows a more full range of conditions which produce the lustrous chromium and the remaining area indicates the conditions which produce chromium that is relatively non-lustrous and not fully hard. The non-lustrous types of chromium vary from being of "milky" surface appearance to matte and crystalline in appearance. The hardnesses being from about 700 V.P.N. to about 400 V.P.N. The chromium that occurs below hardnesses of about 500 V.P.N. may be relatively soft and brittle or soft and almost ductile. The brittle soft deposits occur at the lower temperatures and the less brittle to almost ductile deposits occur in the higher temperature range. These deposits are those which may be expected from a freshly prepared or comparatively new solution.

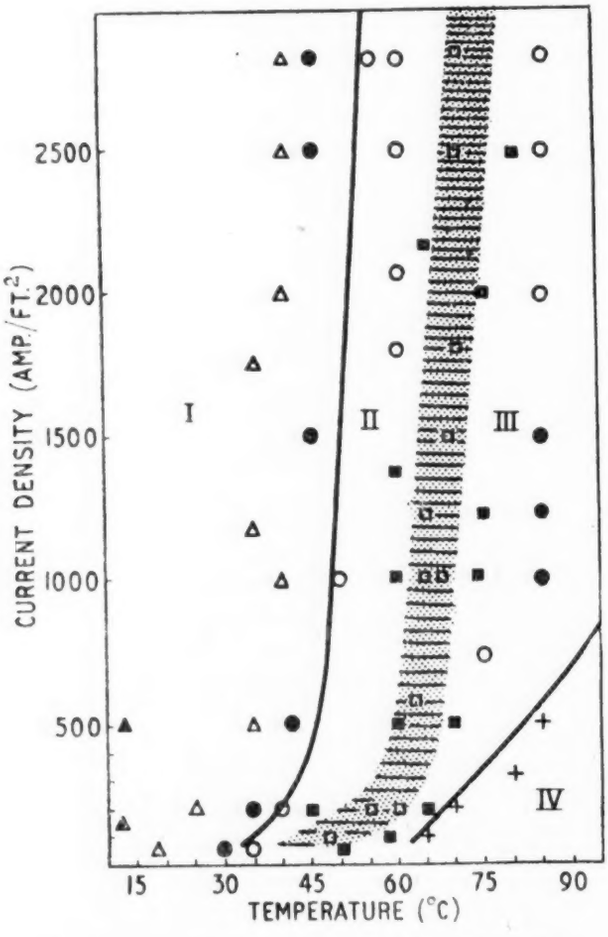


Fig. 1. Graph showing range of conditions under which lustrous hard chromium plate may be produced. *(Hume-Rothery).*

Contaminants

It is found, however, that in the ordinary procedure of "working" a chromium solution over long periods there are apt to accrue excessive quantities of the products of electrolysis such as trivalent chromium or contamination of the solution by introducing metals other than chromium to the bath. The contaminating substances may, by way of example, be introduced by slow dissolution of the cathode metal in the bath or from impurities in the chromium salts. One of the effects of the presence of these metals is to reduce the range of conditions in which the lustrous hard chromium may be produced and increase the range in which the non-lustrous and relatively soft deposits occur. Maladjustment of the chromic acid and sulphuric acid content of the bath together with increasing amounts of contaminating metals will reduce the "bright" range to almost nil and finally will fail to deposit any type of chromium at all. A further effect of the presence of select amounts of metals other than chromium is that with suitable temperature ranges a wider range of cathode current density than is usual in chromium plating, is permissible without producing burnt and crumbly deposits at the cathode extremities.

It was observed in the early days of chromium plating that the presence of such metals as iron, nickel, aluminum, etc., had the effect that the brighter types of chromium occurred at a lower temperature range and required a lower current density and voltage to disassociate the chromium from solution. Perhaps the first claim in this respect was made in a patent taken out by the Chromium Products Corporation and John Hosdowitch.[1] The specification mentions the addition of iron and aluminum specifically in amounts up to 30 gm/l as carbonates, sulphates or the like. A broader suggestion is also made that a similar effect is obtained with the addition of any metal below chromium in the electro-chemical series if present in quantities above gm/l. The specification describes "The metals other than chromium added to the bath do not 'plate-out' aid the chromium deposits may be had ranging in color from bright highly lustrous through a frosted condition down to a dull gray." It also mentions that the deposits have desirable properties both from a physical and chemical point of view. It seems that some of these metals if present in quantities as stated do in fact have the economic attraction that less heat and current is required for plating and the "throwing" power of the bath at low temperatures is improved, which was the object of the patent. The deposits obtained at their "brightest" from these baths, however, have a surface bloom or very slight milky appearance which is indicative that

the chromium is not so hard as the fully lustrous metal that is obtained from chromium baths that do not contain other metals. Similar claims in respect of the addition of metals other than chromium to the chromium bath are mentioned in a patent taken out by Siemens and Halske.[2] Aluminum, copper and lead are preferred in this case. Magnesium or aluminum is suggested in another patent by W. Poetzsch.[3] Further patents related to the same subject have been taken out since. It is a feature of some of these softer deposits that either because of their relative softness or because of an improved affinity for hard base metals, they adhere better than hard chromium. The soft deposits although relatively poor in resistance to surface abrasion have a similar high resistance to friction as the hard deposits. They have further qualities in that they do not possess the mosaic-like pattern of cracks that are present in all deposits above about 700 V.P.N. and in the "as plated" condition when removed from the bath they provide a surface condition that is conducive towards a high degree of adhesion between the soft deposit and a hard outer layer as produced from the usual "hard" chromium bath.

"Striking" the Work

It is a common practice in chromium plating difficult base alloys in the standard chromium bath to "strike" the work at a high current density at the commencement of deposition and subsequently to reduce the current to normal. This is about the only way to get the chromium deposit to start on some steel alloys. This practice does, in effect, produce a thickness of chromium that comprises a soft initial deposit upon which is built up the greater thickness of hard chromium. Such composite deposits reduced entirely from the standard bath have an unnecessary low resistance to distortion and impact partially because the initial deposits produced by "striking" are highly stressed, brittle and crumbly at the cathode extremities. This is unsuitable to support a hard outer layer that is likely to be subjected to pressure. However, the presence of the weak under layer produced by this method is often better than trying to deposit fully lustrous and hard chromium direct on to a difficult base.

The composite deposit is greatly improved by selecting a softer under layer that will provide some reasonable resistance to pressure and it is to be found in the standard chromium bath to which is made additions of metal other than chromium. Almost any metal lower than chromium in the electrochemical series is suitable, but the preferred metal to add is iron.[1] An addition of 20-30 gm/l of iron to the standard bath containing from 250-350 gm/l chromic acid with a sulphate ratio of 100:1 used at a temperature of 40° C. produces with selected current densities a softer type of chromium that adheres well to ferrous metal bases, has a surface that is ideal for adhesion with an outer hard layer of chormium and gives the composite deposit in which it is present a satisfactory degree of resistance to impact and distortion. This method of providing composite chromium deposits does involve the use of an extra plating

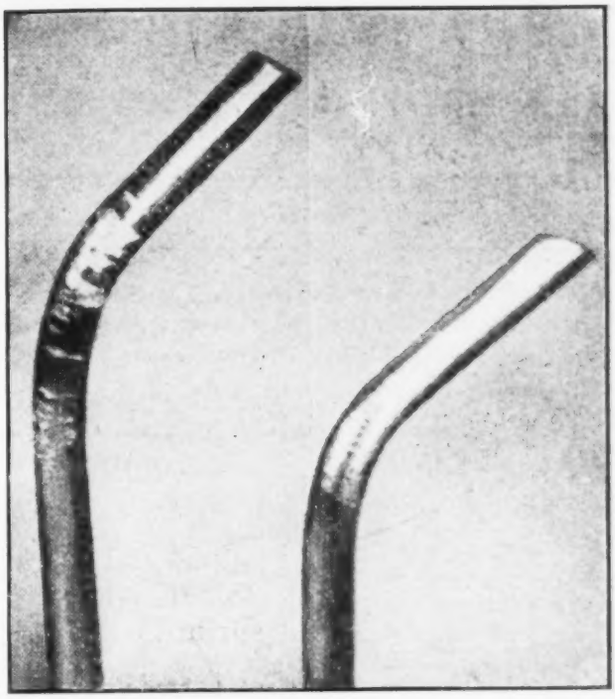


Fig. 2a—(left). Hard chromium covered nail bent through 90°.

Fig. 2b—(right). Two-bath chromium deposited nail bent through 90°.

bath but the results certainly justify the expense. The procedure is to plate the component first in the iron/chromium bath and after a given period of deposition, rinse preferably in a spray of hot fresh water to remove all traces of iron and transfer quickly to plate in the standard hard bath. The thickness of the initial deposit after five minutes in the bath will give considerable benefit but the best composite coating for all round good performance is that having about one-third the thickness soft and the remainder hard. After cleaning the component to be plated a period of immersion in the iron/chrome bath without current is necessary to raise the temperature of the job to that of the solution and the work should not be allowed to chill until the complete composite deposit is finished. The "throwing" power of the iron/chrome bath is not so good as that of the standard hard bath but this may be overcome by careful arrangement of the electrodes. It is not difficult by this method to secure sound adherent deposits upon bases of fully hard chromium either in its "as-plated" condition or after grinding or lapping which dispenses with the undesirable necessity of stripping worn deposits before further deposition. Similar good deposits may be obtained upon very hard steel surfaces such as nitrided components, etc., and a good degree of adhesion may be obtained upon cast-iron bases that are normally not considered suitable for chromium deposition. A simple test that shows the behavior of chromium deposits when bent is illustrated in Fig. 2. Fig. 2a shows a section of an ordinary 3 in. wire drawn nail provided with approx. 0.010 in. hard

(*Concluded on page 538*)

SHOP PROBLEMS

PLATING AND FINISHING
POLISHING—BUFFING
CLEANING — PICKLING
HOT DIP FINISHES

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Immersion Aluminum Treatment

Question: We are interested in a chemical immersion treatment for sheet aluminum that will produce a satin finish. The parts to be treated will be formed sections such as window frames and other interior trim for buses. The metal that we intend to use will be secondary aluminum, analysis rather indefinite, but, possibly one that will not contain more than 8% to 10% of alloying elements other than the base aluminum.

Any information that you may have available on this subject will be helpful.

C. W. H.

Answer: This finish may be produced by etching in 10% caustic soda solution at about 130° F. followed by a dip in 50% nitric acid for copper containing alloys or one part hydrofluoric acid and three parts nitric acid at room temperature for silicon containing alloys.

Water

Question: Is it necessary to use distilled water for silver cyanide, copper cyanide and nickel sulfate solutions? Also we would like to know if it is satisfactory to use the same hot and cold rinses for copper, nickel and silver plating. We have a running cold water rinse and a stagnant hot rinse. We would like to utilize them for as many operations as possible.

W. H. G.

Answer: If the water supply is very hard, trouble will result in the plating department. An ion exchanger, however, will be much cheaper to operate than a still and will produce water of sufficiently high purity.

Whether the same rinses can be used for various operations would depend on the plating cycle. However, we would advise that the same hot water rinse can be satisfactory as a final rinse before drying all finishes.

Speculum Plating

Question: The other day I came across the following item in the Cleveland Plain Dealer:

"Tableware, tea services, plumbing fixtures, and many other household metal articles will soon emerge with bright, shining coatings of *speculum*, an alloy of tin and copper. It provides a bright finish at low cost and without the tendency to tarnish of silver or the bluish tint of chromium."

I would greatly appreciate it if you would send me any information you might have on the above process.

J. B.

Answer: Speculum is an alloy of 45% tin and 55% copper. Separate anodes of tin and copper are used and their rate of solution must be closely controlled by individual circuits.

We do not know of this process being used commercially in this country although we have reports that a few plants in England are depositing the alloy. In this country, a hard white alloy of tin, copper and zinc has been used to some extent for the same purpose.

A paper on the electrodeposition of speculum appeared in the Journal of the Electrodepositors' Technical Society, Volume 21, Page 19-44 (1945). It is suggested that photostats of this article be obtained from the New York Public Library.

Russian Gold

Question: I have had inquiries from some of my customers who wish to have their costume jewelry plated in the Russian Gold finish. Can you please advise me on this subject?

H. S.

Answer: Produce the smut in the following:

46% Sodium gold cyanide	½ oz.
Cadmium oxide	1½ dwt.
Lead acetate	5 grains
Sodium cyanide	1 oz.
Water	1 gallon

Use warm at three volts.

After the smut is applied, it is relieved by bicarbonate and the article is then flashed in a regular green or 24 Kt. gold solution.

Oxidizing Copper

Question: We are forwarding some samples of hardware we would like to match. We are using the cyanide copper formula given in the 1945 *Guidebook* and oxidizing with polysulfide. You will note that our copper color on the highlights do not match the samples.

C.W.

Answer: The chocolate brown color is produced on a bronze base, not on a copper base. A lacquer with a yellow tinge has been used on the oxidized copper sample. It is suggested that a small amount of yellow dye be added to the lacquer. Such dyes are obtainable from suppliers of lacquers.

A bronze tone can be given to the copper deposit by adding a small amount of cadmium oxide.

Sediment in Silver Bath

Question: A year ago I stored my silver solution. Now I would like to use it again for platirg. The solution is satisfactory but quite a bit of crystals have formed on the bottom. What are these crystals? Are they any good to dissolve and put back in the solution?

V. R.

Answer: These crystals are probably carbonates and should be discarded.

Gold Thickness Test

Question: In the April issue of *Metal Finishing*, we noticed you mentioned

a method to determine the thickness of electrodeposited gold on jewelry. Please advise where we can communicate with Mr. W. Stanley Clabaugh of the "Journal of Research" so that we can get the full information.

I. G.

Answer: Mr. Clabaugh can be reached at the National Bureau of Standards, Washington, D. C. For a copy of his paper, however, we would suggest that you write to the Sup't of Documents, Government Printing Office, Washington, D. C. as they probably have copies of this article for sale.

Bright Gold

Question: Whom would you suggest we contact in order to give us some information in connection with formulas to use in brightening the background of our gold rings before they are polished?

For instance, in rings that have high heads, being very difficult to get at them by the polisher, we would like to obtain some formula that we could use electrically to produce this desired bright effect.

Possibly you might have some information that you could supply. In any case we would appreciate hearing from you in this regard.

T. M.

Answer: We suggest that you use a jeweler's stripping solution which consists of the following:

Copper cyanide	2 oz./gal.
Sodium cyanide	4 " "
Temperature	200° F. with reverse current at 6 to 12 volts.

Chain Polishing

Question: The writer has been trying to locate a company that makes special automatic polishing equipment especially for chain polishing, such as is done in the jewelry trade.

Can you locate for us any companies who specialize in this kind of equipment? Your assistance in this matter will be appreciated.

L. S. B.

Answer: It is our impression that this type of work is done in bulk by burnishing in a jeweler's tubbing machine, obtainable from most plating supply houses.

Nitriding Stop-Off

Question: I would like to know about nickel plating .0001" thick on 400 series stainless steel for nitriding.

M. W. B.

Answer: A nickel deposit will adhere to stainless steel if it is first treated in the following solution:

Nickel chloride	2 lbs./gal.
Hydrochloric acid	1 pint/ "
Room temperature	6 volts direct current, nickel or carbon anodes
Time	30 seconds to 1 minute

Are you sure that this nickel deposit will be suitable for nitriding? Ordinarily, .002" of tin is employed as a stop-off for this purpose.

Cadmium Brightener

Question: Is there a patent or unpatented method that is valid for making a cadmium brightener out of postum?

L. L.

Answer: The postum brightener for cadmium was covered by U. S. Pat. #1,692,240.

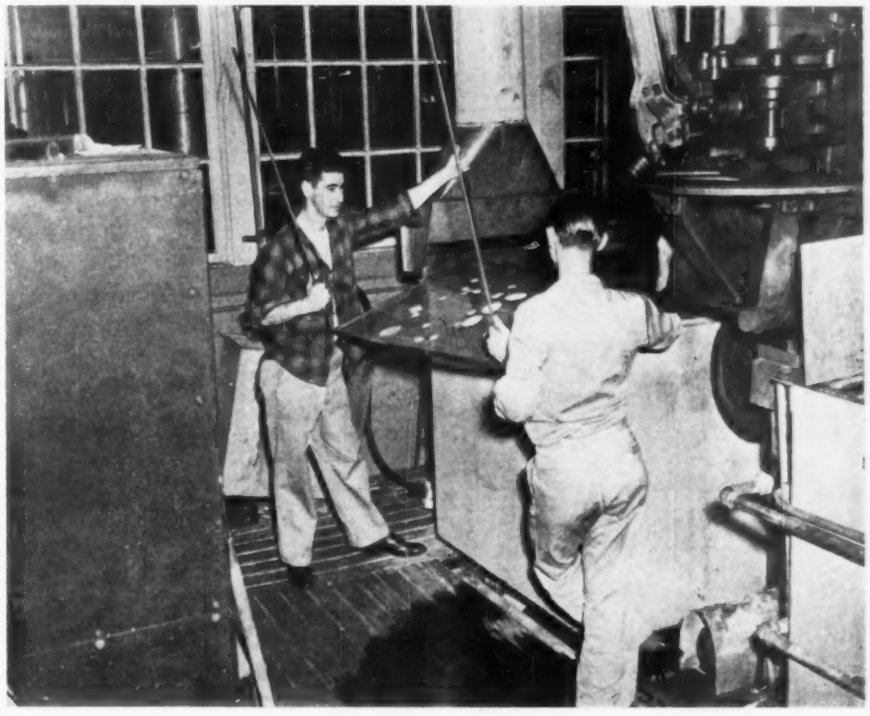
Cadmium, Chromium, Copper Plating

Question: Is there any way of precipitating chromium in cadmium solutions? Is there as much poisoning in copper cyanide solutions, as in stripping some of our copper, we use the chromic acid strip on account of aluminum inserts.

Do you know any method of assuring hard chromium deposits on cast iron? We experience some difficulty. Does the solution need sugar as an addition agent, and how much, and in what form is it added?

H. K.

Answer: Procedures for chromium plating on cast iron will be found on page 21 of the 1945 edition of the *Plating & Finishing Guidebook.* Chromium in cyanide plating solutions can be reduced to the harmless trivalent form by adding soldium hydrosulfite. Sugar should not be added to chromium solutions.



In this unusual application, plastic screen cloth produced by the Lumite Division of the Chicopee Manufacturing Corp., New York, is used in an electroplating operation to retrieve small objects which drop from plating racks into the solution. It is lifted as often as necessary for recovery of the objects, eliminating any need for emptying the tank. Woven from extruded strands of vinylidene chloride, with consequent high impact and tensile strengths, the plastic screen cloth's chemical inertness is assurance of long life and a guarantee against possible contamination of the electrolytic solution.

THIS IS WASHINGTON—

By George W. Grupp
METAL FINISHING's Washington Correspondent

Meet the Present and Prepare for the Future

Now that peacetime production wheels have begun to turn, the electroplating industry should meet the present and prepare for the future by taking an inventory of things and conditions of the present and use imagination and common sense to plan for the utilization of facilities to the full for a bright future.

To achieve this objective the industry must free itself from the bondage of any ignorance, prejudice and fear; and it must have the courage to choose, achieve and practice better and more efficient methods. It must tutor, inform and acquaint itself with new and better forms of electroplating and revise some of its advertising and selling methods. It must set for itself new goals. All of this means making necessary changes and improvements if the hoped for goal is to be achieved.

Methods should be found to use the war-used excess equipment. During the war there was an increased usage of barrel and rotary equipment. This equipment and other plating machinery will deteriorate rapidly if it is not put to full usage and if its owners are too tired to discover mistakes in their methods of selling metal finishing services.

Markets for plating services are not created by men who bolt their doors against thoughts of tomorrow; nor by men who sit in their shops in smug satisfaction. One must not forget that the reduction, or cessation, of civilian plating in commercial job plating shops during the war means that those shops must now re-establish their contacts with old customers and establish contacts with new ones. And since selling has always been one of the weak spots of commercial job plating shops, Dame Fortune will reward the indifferent owners with ghost shops.

In preparing for the future the commercial job plating shops should first take an inventory of their present methods of advertising and selling; their prices and pricing methods; their cost of performing each kind of operation in their shops; their kinds of plating service such as cadmium, chromium, gold, nickel, silver and zinc; and their actual present existing facilities and equipment.

Job platers should inspect their present equipment and determine their degree of efficiency. All worn-out parts and equipment should be replaced with the best and latest equipment and parts to enable them to render plating services which creates satisfied customers and adequate profits to the owners.

Excessive equipment, or facilities to perform services for which there is little or no local demand, should be avoided to keep down the overhead charges.

Commercial job platers who do not know the cost of performing each operation in their shops never know they are losing money until the sheriff knocks at their doors.

Production costs should be separated from distribution costs (such as salesmen's salaries, expenses and supplies; advertising; and commissions to brokers and agents), for two reasons. First, to determine the profitableness of soliciting business with certain types of manufacturers and in specific areas. Second, production costs are not affected by the circumstances of selling plating services.

For example, the cost of plating specific standardized items during a definite period of time should be the same irrespective of where the customers of a particular shop are located; but the distribution costs will vary between old customers in established shop areas and those of customers in new areas because of the increased sales resistance of potential customers in new territories.

All such knowledge of costs must be known by commercial job platers if they wish to quote the right prices for their services. Good pricing is essential if commercial job plating shops are to operate profitably.

To be properly prepared for survival, commercial job plating shops should know something about their competitors' methods of advertising and selling, prices, costs, services and facilities.

Next, the commercial job platers should know something about the actual and potential market for plating services in their particular locality. They should have in their possession such information as (a) the number of competitors and the kinds of plating services they render; (b) the volume of business performed by themselves and by their competitors to determine their degree of possible expansion of business; (c) the names of actual and potential customers of their competitors and of themselves in their trading area; (d) the kinds of local industries which could use plating services; (e) the trend of local industry; and (f) the number and sources of plating supplies and equipment as well as available skilled labor.

They should constantly study the old and new prod-

ucts made in their community to determine where they could fit into the picture of the manufacturers of those products. In other words, they should seek out old and new customers among the local manufacturers of such items as automobiles, cutlery, fountain pens, flatware, hospital equipment, household utensils, hardware, headlights and reflectors, hairpins, jewelry, lighting fixtures, mechanical pencils, nails, plumbing supplies, surgeons' and dentists' instruments, stoves, sewing machines, typewriters, wire and wire fencing, and a myriad of other things.

To sell plating services to these and manufacturers of other commodities, commercial job platers must learn to plate on glass, plastics, paper and other materials if they wish to keep their facilities humming with activity.

Their salesmen must not only know the advantages and disadvantages of each kind of plating and finish for different materials and commodities of their prospective customers but they should also be able to point out to them how different types of protective coatings and finishes will increase the eye appeal of the customers' commodities and help them break down buyers' sales resistance.

Commercial job platers should sell their workmanship and the appearance of their establishments and facilities by inviting actual and potential customers to their shops. They should advertise and sell their willingness to help customers to produce the best possible protective coatings and finishes for their particular commodities. But in educating prospects on how to improve the durability, quality and salability of their products with protective coatings and special finishes the commercial job platers should not forget to sell their services because educating prospects is one thing and selling plating service is another.

The Walls of Jericho Fell Last Month "Humpty Dumpty sat on a wall; Humpty Dumpty had a great fall; all the king's horses, and all the king's men, cannot put Humpty Dumpty together again," because the walls of Jerico fell in an election which was a catastrophe for the Democrats, "finis" for Franklin D. Roosevelt's New Deal, and the death blow for government control of prices and wages.

President Harry Truman finally saw the handwriting on the wall when he announced the decontrol of all prices, salaries and wages, except on rent, rice and sugar. The President had no other alternative because of the labor situation and the patched up system of price control which functioned in a weak fashion in some directions and not at all in others. Unfortunately, the President's announcement came too late to stop a wave of strikes for higher wages which may soon sweep this country.

The conservative unions, like the International Association of Machinists, feel that labor has always had friends in both parties. And while some reactionary Republicans are talking about putting over anti-labor legislation at the next session of Congress, the more level-headed G.O.P. leaders may well put the brakes on such a drive.

On the other hand, the CIO believes the election was a "stunning defeat for American labor and liberals;" but, announced Jack Kroll, director of the CIO Political Action Committee, "there will be no retrenchment. We will go on fighting for Franklin D. Roosevelt's program."

Prophets, like Henry A. Wallace and Chester Bowles, can only see economic disaster resulting from the recent election and decontrol of prices; but those of the supply and demand school of thought are of the opinion that while prices will rise to a certain extent they will in the not too far distant future level off as supplies flow into the market.

For about five years the Government took over the delicate and difficult problem of establishing prices. Now that it is again back into the hands of management the re-establishment of a free price system is not going to be as simple as some may think because the price-cost relations were distorted by wartime influences. And to avert the disaster which men like Wallace and Bowles predict, businessmen must establish prices based on a willingness to subordinate present advantage for long range advantage on restraint and on sound judgment. And labor and management, as President Truman pointed out, must learn to pull together as a team for the best interests of the country's welfare.

Chemical Production in September The Commerce Department's Bureau of Census reports that during the month of September, 1946, there was produced in the United States 77,492 short tons of synthetic anhydrous ammonia; 73,730 short tons of original solution of ammonium nitrate; 19,658,000 pounds of synthetic ammonium sulfate; 29,789 short tons of hydrochloric acid; 184,000 gallons of methanol; 54,136 short tons of nitric acid; about 140,000 short tons of phosphoric acid; about 650,000 short tons of soda ash; about 200,000 short tons of caustic soda; about 20,000 short tons of sodium phosphate; about 65,000 short tons of sodium sulfate; and about 2,000,000 short tons of sulphuric acid.

All Government Controls Expected to be Eased Now that wage control is dead and price control is on its death-bed, breathing its last with rice, rent and sugar controls, it is the opinion of certain experts that it will not be long before wartime controls will be eased or eliminated by the National Housing Agency, the Office of International Trade of the Department of Commerce, the War Food Administration functions of the Department of Agriculture, the Office of War Mobilization, and the Civilian Production Administration.

Harriman Believes in Preserving Small Business Commerce Secretary W. Averell Harriman recently declared that "we must ever preserve and foster the opportunity for men with initiative to start new business enterprises and to prosper if they are serving the needs of the people. Opportunity requires a climate in which risk, adventure and daring can have their fair reward. I believe earnestly that government and all business should work together in the maintenance of this climate by which new and smaller business can be fostered. Our democracy and the preservation of our personal freedoms and free enterprise rest on the birth and life of new and small business."

German Electroplating Industry Subject of O.T.S. Report A 98-page report, PB-32158, on the German Electroplating Industry, may be obtained from the Office of Technical Services of the Department of Commerce for seven dollars.

Group Asks That Patent Office be Expanded Officials from 14 patent law associations have suggested to Secretary of Commerce W. Averell Harriman that the Patent Office should be expanded and that all activities should be placed in one building. Secretary Harriman told the group that he was aware of some of the most pressing needs of the Patent Office. He told them that the Commerce Department was already studying ways and means of improving the present facilities.

Employers Right to Reply to Unions Upheld by Courts Labor relations experts are of the opinion that to end union abuses the incoming Congress should not pass a lot of new legislation but instead see how existing laws can accomplish the desired objective. This they premise on the recent decision of the Federal Circuit Court of Appeal in St. Louis, Mo., in which the court overruled the National Labor Relations Board by declaring that

the union's publications were "defammatory and inflammatory"; and that Montgomery, Ward & Company had a right to reply to the unions.

Hundreds of Wartime Laws Are to be Tossed Out the Window Reconversion Director John R. Steelman is studying 520 wartime laws for scrapping. About 70 of these laws, it is reported, could be tossed into the waste basket without any action by Congress. And about 203 other laws are said to present no great scrapping problem. The life of most of these laws are automatically terminated by (1) "The termination of the emergency"; (2) "The termination of hostilities"; and 3) "the termination of the war." The new Congress is expected to get rid of a lot of wartime measures by passing a bill to officially end the war.

Incentive Plans Pushed to Avert Labor Disputes In an effort to avert future wage disputes, management is seeking incentive plans which will increase the workers' earnings without increasing the manufacturing costs. O. C. Cool, director of the Labor Relations Institute put it this way: "There is little use of management talking about the need for more production unless our nation's business men are prepared to sell the American worker on the fairness and feasibility of achieving higher wages through acceptance of an incentive plan. The big need of the moment," he continued, "is to turn to the only industrial instrument known that makes increased wages possible without corresponding increases in prices. That instrument is the incentive system."

Priorities Regulation 13 Has Been Amended The Civilian Production Administration amended on November 13, 1946, its Direction 16 to Priorities Regulation 13 as it concerns urgency certificates for surplus materials and equipment. The amendments deal mostly with housing.

Unemployment Declining The Bureau of Census of the Department of Commerce reports that the number of unemployed at the week ending October 12, 1946, was 1,950,000 as compared with 3,090,000 for the week ending July 14, 1945.

Low Reflection Coating Developed How durable low-reflection coatings for optical lenses can be made from an inexpensive commercial grade of magnesium fluoride is described in report PB-32603, sold for two dollars by the Department of Commerce's Office of Technical Services.

Zinc Production in October The American Zinc Institute reports that the production of zinc during October, 1946, amounted to 64,138 tons as compared with 58,475 tons in September, 1946, and with 59,752 tons in August, 1946.

Truman Asked to Free Copper To end the nation's critical shortage of copper, President Truman has been urged to decontrol copper prices and to reduce the tariff on copper imports.

Tin Conference Scheduled for 1947 Early in 1947 there will be a meeting of the International Tin Conference which will deal with the world's surpluses of tin. This conference is expected to furnish guideposts for the dealing with other commodities.

Platinum Prices Drop The fall in the price of platium in October was said to be due to speculators. Before the drop some industrial users of platinum began to use substitutes because they felt they were unable to pay the inflated prices. Some think a further drop may be expected.

Government Taps Zinc Stockpile to Help Manufacturers During the past month the Government tapped its stockpiles of all six grades of zinc to help manufacturers keep their plants in operation. About November 1st the Government's stockpiles consisted of 3,000 tons of special high grade for die castings and electroplating; 140,000 tons of high grade, intermediate, and brass mill special zinc for use in making brass mill products; 21,000 tons of select zinc for use in brass mill and zinc rolled products; and 15,000 tons of prime western zinc for galvanizing purposes.

Silversmiths' Ware May be Imported in United Kingdom Under an arrangement between the British and United States Governments the British Board of Trade has added 36 additional items to its list of products which may be imported from the United States into the United Kingdom in limited quantities. The new items include varnish cambric insulating material, and goldsmiths' and silversmiths' wares.

$35,000,000 Worth of Surplus Chemicals For Sale The War Assets Administration is offering to sell surplus chemicals which cost the United States Government about $35,000,000. These chemicals include hydrochloric acid, sulphuric acid, hydrofluoric acid, nitric acid, tartaric acid, solvents, copper naphthenate, synthetic and natural glues, zinc carbonate, picric acid, cleaners, water treating compounds, coal tar, borax and boric acid, metal salts, oxides and hydroxides, and other chemicals.

Silver Worth $4.00 Sold for 40 Cents During the past month an agent for the War Assets Administration was offering chemical-filled bags which were prepared to purify salt water for fliers who were forced down at sea. These were offered at the price of 40 cents each. Before long he was pressed by bidders who offered to pay as high as $2.80 per bag. This aroused the agent's curiosity. Upon investigation he found that these bags which he had first offered for 40 cents each contained about $4.00 worth of refined silver.

IMPROVED CHROMIUM PLATE

(*Concluded from page* 533)

chromium only. When bent to an angle of 90° the deposit at the extreme part of the bend burst and left the base metal exposed. Fig. 2b shows a similar specimen provided with an initial 0.003 in. of deposit from the iron/chrome bath and 0.007 in. from the hard bath. The deposit has opened at the extreme part of the bend but has not flaked from the base. The surface hardness of both deposits is similar. The claim made in respect of the two-bath composite deposit is that a deposit consisting of soft and hard chromium using two separate baths as described, has a greater resistance to the effect of impact, pressure and heavy wear than that of a similar thickness of either quality existing by itself upon a similar base metal.[4]

This method may be recommended since it does make it possible to provide a more substantial thickness of chromium as protection against general wear upon classes of work that at present can only be provided with the limited "flash" deposit.

References

1. U. S. Patent No. 258,219 (1926).
2. U. S. Patent No. 259,984 (1926).
3. U. S. Patent No. 296,988 (1928).
4. British Patent No. 568,161 (1945).

Patents

Tin Plating

U. S. Pat. 2,407,579. E. W. Schweikher, assignor to E. I. du Pont de Nemours & Co., Sept. 10, 1946. A tin electrodepositing composition comprising an alkali fluoride and stannous chloride, the composition upon being dissolved in water to give a stannous chloride concentration of between about 37.5 and 150 grams per liter satisfying the equation:

$$pH = \frac{k(\text{mols MF})}{\text{mols } SnCl_2}$$

wherein the following conditions are simultaneously true; the pH is equal to about 1 to 5, k has a value from 0.1 to 1.0, MF is alkali fluoride, and the mol ratio.

$$\frac{MF}{SnCl_2}$$

is about from 2 to 12, the static solution potential of tin in the bath being equal in volts to from

—0.055 pH—0.265 to —0.055 PH—0.370

Pickling Steels

U. S. Pat. 2,408,424. J. J. Healy, Jr., M. H. Taylor and F. A. Abbiati, assignors to Monsanto Chemical Co., Oct. 1, 1946. The method of pickling stainless steels which comprises immersing them in an aqueous acid reacting non-electrolytic pickling bath comprising essentially water, mineral acid and active pickling agents consisting of ferric sulfate and an alkali fluoride, said sulfate being present in the bath in an amount varying between 1 and 30% and said fluoride being present in an amount varying between 0.6 and 25%, said bath being substantially free of nitric acid.

Polishing Tool

U. S. Pat. 2,409,363. A. Kratky, Oct. 15, 1946. A grinding and polishing body formed of bands of different breadth the bands being alternately wider and narrower, in such a manner that next to a wide band there is always a narrower band the abrasive grains being pressed into the gaps formed between the bands of the greater breadth.

Abrasive Backing Pad

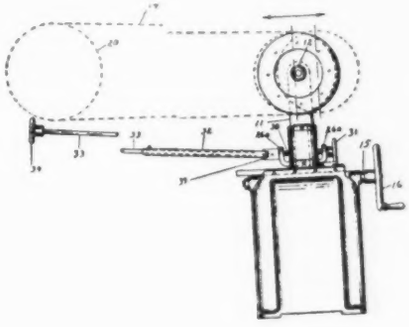
U. S. Pat. 2,409,163. W. Stever, assignor to the Budd Co., Oct. 8, 1946. Flexible disk for supporting abrasive means, said disk consisting of sheet material and comprising a wide substantially flat annular marginal portion, an intermediate narrow annular portion forming a beading on one side and an open groove on the other side of the plane of said disk as defined by its said marginal portion and a central portion adapted for attachment to a supporting head, said beading and groove imparting to the disk added flexibility and reducing warping and breakage.

Electrodeposition of Indium

U. S. Pat. 2,409,983. W. M. Martz, assignor to General Motors Corp., Oct. 22, 1946. A process for the electrodeposition of indium which comprises passing electric current through an electrolyte composed essentially of an aqueous acid solution containing at least one compound of the class of compounds consisting of indium fluoborate, indium fluosilicate, and indium fluoride.

Abrasive Belt Control

U. S. Pat. 2,407,499. S. H. Klossner, assignor to Divine Bros. Co., Sept. 10, 1946. In a measured tension control for an abrasive belt system, a pedestal, a slide adapted to move in said pedestal, an arm carrying a



pully mounted on said slide, bosses depending from said slide, a screw mounted in said pedestal and piercing said bosses, means for turning said screw, a nut mounted on said screw between said bosses, a compression spring interposed between said nut and one of said bosses, whereby rotation of the screw will increase tension on said spring and move said slide, to increase tension on said belt, and means on said slide for rocking said pulley, whereby to track said belt.

Nickel and Cobalt Plating

U. S. Pat. 2,409,119. M. L. Free, assignor to the Seymour Mfg. Co., Oct. 8, 1946. An aqueous, acid electroplating bath which comprises in the aqueous medium a metal-ion yielding material consisting essentially of a mixture of the sulfate and of the chloride of one of the metals selected from the group consisting of nickel and cobalt, together with an amount of a sulfonated aryl aldehyde sufficient to permit a brilliant cathodic deposit of the metal to be obtained upon the passage of an electric current from an anode comprising said metal thorugh the bath to a cathode, under the operating conditions.

Bright Nickel Plating

U. S. Pat 2,409,120. M. L. Freed and O. A. Stocker, assignors to The Seymour Mfg. Co., Oct. 8, 1946. An aqueous electroplating bath for producing by electrodeposition under acid conditions a brilliant, cathodic deposit of nickel, which bath comprises in addition to nickel ion yielding material selected from nickel sulfate, nickel chloride, and a mixture of nickel sulfate and nickel chloride, a thiourea as the brightening agent and in a concentration less than about one and one-half grams per liter but in a quantity sufficient to permit a brilliant deposit of nickel of unusually satisfactory hiding power to be obtained under the operating conditions.

Electrolytic Polishing

U. S. Pat. 2,409,097. C. Batcheller, Oct. 8, 1946. The method of polishing the surface of a metal alloy of the group consisting of "Monel" metal and the chrome-nickel stainless steels, which comprises subjecting the alloy to electrolytic action as anode at a current density of from about ½ to about 30 amperes per square inch and in an electrolyte containing a plurality of ingredients of which the following, in the percentages by weight stated, are the only necessary ingredients, free sulphuric acid from about 15% to about 55%, a second acid selected from the group consisting chromic, vanadic, metavanadic, manganic and permanganic from about 2% to about 20%, and the balance water; the temperature of said electrolyte being in excess of about 160° F.

Aluminum Cleaning

U. S. Pat. 2,409,271. N. Goldowski, assignor to Welding Research, Inc., Oct. 15, 1946. A method of cleaning aluminum to prepare the same for welding, which consists in preparing an aqueous solution essentially consisting of approximately twenty per cent sodium sulphate and approximately ten per cent nitric acid, immersing the aluminum in said aqueous solution whereby sodium bisulphate is generated in the presence of nitric acid to effect the desired chemical action on the aluminum for cleaning the same, and then removing said cleaned aluminum from the solution.

Lead Stripping

U. S. Pat. 2,408,931. R. L. Heath, G. A. Fisher, Jr., and T. R. Holbrook, assignors to General Motors Corp., Oct. 8, 1946. A process of stripping a metallic coating from a steel-backed silver bearing, said coating consisting of a metallic material of the class consisting of lead, lead-tin and lead-indium, which consists in wiping oil from the bearing, removing any rust spots which may be present by buffing, removing any moisture from the bearing, immersing the thus treated bearing in a solution consisting of 95%, by volume, of glacial acetic acid, and 5%, by volume, of an aqueous solution containing 30% hydrogen peroxide until the coating is stripped, thereafter thoroughly rinsing the bearing in water, then in an alkaline solution, then in water and thereafter drying the bearing.

Stripping Copper from Zinc

U. S. Pat. 2,408,220. J. C. Lum, assignor to Westinghouse Electric Corp., Sept. 24, 1946. The process of rapidly and substantially completely removing a surface layer of a metal of the group consisting of copper and

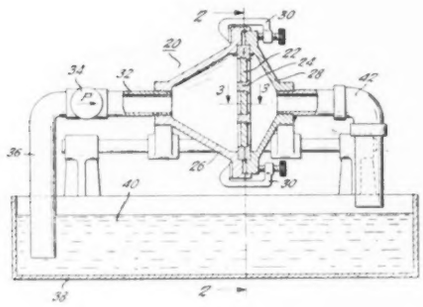
copper base alloys containing a major amount of copper applied to a zinc base member without detrimentally affecting the zinc base member which comprises immersing the member in an aqueous solution composed essentially of from saturation to one part by weight of an alkali metal cyanide and from saturation to one part by weight of an alkali metal sulfide for each 100 parts by weight of water and applying direct current, the member being the anode while being immersed in the solution.

Zinc Plating

U. S. Pat. 2,407,489. A. G. Gray, assignor to E. I. du Pont de Nemours & Co., Sept. 10, 1946. In a process for the electrodeposition of zinc, the step comprising effecting electrodeposition of zinc from an aqueous acid-zinc electrodepositing solution in the presence of about from .05 to 5.0 grams per liter of 1-anthraquinone sodium sulfonate.

Coating Porous Metal

U. S. Pat. 2,409,295. J. T. Marvin and R. P. Koehring, assignors to General Motors Corp., Oct. 15, 1946. A method of coating the entire porous surface of a porous metal article having pores passing completely through the article with a metal lower in



the electrochemical series than the metal of the article and wherein the coating is metallurgically bonded to the surface of the article, the steps comprising; continuously circulating solely by mechanical pressure a liquid carrying the coating metal through the pores of a porous metal article for a time sufficient to cause the desired deposition of the metal in said liquid on the surface of the pores of said article, and finally heating the article at a temperature below the melting point of the coating metal for a time sufficient to cause at least partial metallurgical diffusion of the coating metal into the metal of the article whereby the surface characteristics of the porous metal article are those of the metal deposited on the surfaces of the walls of the pores without destroying the porosity of the article.

Coated Abrasive

U. S. Pat. 2,410,506. H. P. Kirchner and A. L. Ball, assignors to The Carborundum Co., Nov. 5, 1946. A coated abrasive waterproof belt comprising a backing consisting of a layer of flexible resilient leather, said leather having a pore stopping sizing coat on one surface and being waterproofed on its outer surfaces, substantially a single layer of abrasive grain on the sized surface of the leather, said abrasive grain comprising a substantial amount of diamonds, and a grain bonding coat of a cured phenol-aldehyde waterproof resin on the sized surface of the leather.

Expansible Wheel

U. S. Pat. 2,410,536. A. Vonnegut, assignor to Vonnegut Moulder Corp., Nov. 5, 1946. An expansible wheel for application to an endless abrasive belt, comprising an annular rim mounting, a series of truncated rim forming sections mounted face to face in annular formation, means for slidably supporting said sections upon said mounting to permit their radial movement relative thereto, said sections when retracted being adapted to engage the endless belt and being movable radially outward there against under the influence of centrifugal force against said belt when rotated at operative speed.

Surface Treating Method

U. S. Pat. 2,410,626. J. M. Boudreau, Nov. 5, 1946. An apparatus for metalizing surfaces comprising an elevating platform, a plurality of units on said platform, means for suspending work over each of said units and periodically advance the work from one position over one unit to a successive position over another unit, means to elevate the platform and units and thereby introduce the several pieces of work in the several units, and means for spraying the work while situated in said units.

A method of metalizing surfaces consisting in continuously circulating different spraying fluids, intermittently and successively subjecting the surfaces to the continuous sprays of said fluids, and continuously adding concentrate to the spray fluid as said fluid circulates, and re-using the fluid.

Vapor Coatings

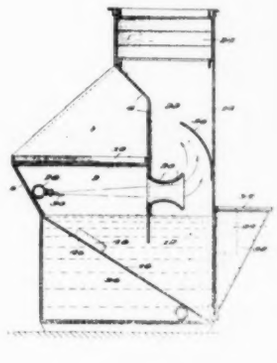
U. S. Pat. 2,410,733. C. W. Hewlett, assignor to General Electric Co., Nov. 5, 1946. In the process of manufacturing mirrors the steps which comprise exposing a polished glass surface to a source of beryllium vapor to form on said surface a coating of beryllium capable of transmitting from 10 to 90 per cent of the light emitted by the source of said vapor, exposing said beryllium coated surface to said source of beryllium vapor and simultaneously to a source of aluminum vapor while gradually increasing the rate of vaporization of the aluminum until the proportions of beryllium and aluminum vapors are such as to deposit on said metal coated surface a beryllium-aluminum alloy of predetermined composition, thereafter gradually decreasing the rate of vaporization of beryllium until only aluminum vapor is condensed on the resulting metal coated surface, heat treating the resultant product to develop the said beryllium-aluminum alloy structure, vapor-depositing a thin layer of magnesium fluoride on the aluminum coated surface and thereafter treating said magnesium fluoride-coated surface with a material selected from the class consisting of long chain fatty acids and the soluble alkali metal salts thereof capable of forming a hydrophobic layer on said composite film.

Abrasive Disk Support

U. S. Pat. 2,410,812. F. De Michel, assignor to W. J. Jacobsen, R. F. Barsotti and Vincent J. Barsotti, Nov. 12, 1946. In a support for abrasive disks adapted to be rotated about a central axis, the combination comprising a plurality of normally flat backing disks of relatively thin fiber material having different radii and superimposed in face-to-face and stepped relationship with the larger disk forming a backing face for the abrasive disk, series of radially and circumferentially spaced air passages extending axially through the backing disks, and means for holding the air passages of adjacent disks in axial alignment for the passage of cooling air therethrough to the abrasive disk.

Polishing Booth

U. S. Pat. 2,409,479. E. F. Fisher, assignor to Whiting Corp., Oct. 15, 1946. A grinding and polishing booth comprising an upright casing having a sump in the bottom thereof for a body of water, an upstanding open top air inlet chamber in its front portion and above and communicating with the sump, and



an upstanding open top air outlet chamber in its back portion and above and communicating with said sump, and embodying a work supporting grill across the open top of the air inlet, a vertically extending cross wall extending between and serving to separate the inlet and outlet chambers and having the lower end thereof dipping into the sump to form a water seal between the lower portions of the two aforementioned chambers, and a diagonally extending wall disposed in the sump, serving to define a sludge compartment above it and a clear water compartment beneath it, and having means at the upper portion thereof for permitting clear water from the sludge compartment to flow into the clear water compartment; a horizontally elongated Venturi tube extending transversely through the cross wall at a point above the sump and serving to connect the two chambers; and means operative to spray liquid horizontally through the Venturi tube into the outlet chamber and thereby cause air to flow downward past the grill and into the inlet chamber and thence upward through the outlet chamber, and including a horizontally extending nozzle-equipped pipe disposed in the inlet chamber adjacent the Venturi tube and a pump arranged to pump water from the clear water compartment to the pipe.

NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY



Motorized Dip Tank

The D. C. Cooper Co., Dept. MF, 1467 S. Michigan Ave., Chicago 5, Ill., announces a new automatic motorized washing and dipping tank. It is especially designed for automatic washing and cleaning of metal parts, giving continuous agitation. All parts can be cleaned automatically, eliminating hazardous hand dipping. One man is said to do the work of 3 to 5. The tank can be supplied for cold dipping, hot cleaning or dipping and heating by electricity, gas, steam.

The unit is built of heavy steel and on the heated models rock wool is packed between the inner and outer tank shells to keep the outside of the tank cool as well as effect a saving in operating cost.

Inside the tank is a special heavy steel rack: the top of the rack frame is equipped with unique gears, arms fitting into a geared motor and cut-off switch so constructed as to permit the inside rack to raise and lower continuously until stopped by pressing a button on the switch. The rack automatically raises and lowers approximately 10 times per minute. The traveling speed of the rack can be lessened or quickened, as desired.

The tank is said to be ideal for dipping metal parts or other objects in wax or rust preventatives. Another new and unusual feature is that by the insertion of a bolt, the rack can be adjusted to stop after each dipping operation. The unit is said to be available for immediate delivery in sizes ranging from 60 to 300 gallon capacity.

Availability of Screening

The C. O. Jelliff Mfg. Corp., Dept. MF, Southport, Conn., manufacturers of wire mesh, wire-fabricated parts, dipping backets, and resistance wire, announces that Lektromesh, which was produced mainly for military uses during the war, is now again available to industrial users of metal screening and filter cloth.

Lektromesh is a one-piece solid metal product, with no woven or other foundation structure; it cannot ravel and is extremely resistant to tearing, it is claimed. According to the manufacturer, it is stiff, strong and wear-resistant, and is readily fabricated by drawing, stamping, welding, soldering, and other secondary operations. Meshes produced vary from 40 to 400 mesh.

The manufacturer will send a sample of the screening to those writing for it.



Contact Wheel

Cool running qualities, which permit use on semi-automatic polishing lathes, are improvements claimed for a newly developed contact wheel announced by The Manderscheid Co., Dept. MF, 810 Fulton St., Chicago 7, Ill.

Presto contact wheels, originally designed for hand finishing, are said to give extraordinary results. Now, it is claimed the addition of five plys of rayon cord, such as is used for truck tires, make the wheels suitable for semi-automatics by keeping them cool and holding their shape. Holes through the rubber give additional cooling beneath the surface and produce the action which snaps the abrasive belt as it leaves the work, beating it clean with 72 hammer-blows per revolution of the 14" wheel, according to the manufacturer.

The wheels are furnished in 9" and 14" diameters with 2", 3" and 4" face. Diameters are precisely uniform so that two or more wheels can be used together to produce any desired width.

Literature mailed promptly on request to the manufacturer.

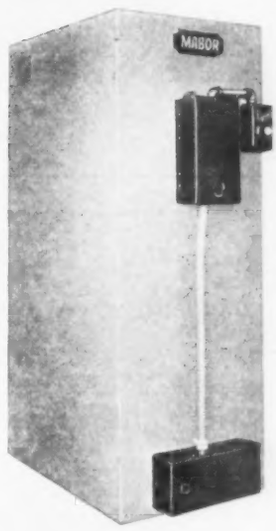
Air Cooled Vapor Degreaser

An improved vapor degreaser embodying an ingeniously controlled cool-air principle has been developed by the Mabor Co. of Clark Township, Rahway, N. J. In addition, the equipment has been so engineered as to require only a plug into power to start its operation, thus eliminating plumbing attachments, and equipped with heavy duty casters, enables the equipment to be used as a portable unit for problems in any section of the plant.

The degreaser is self-distilling and self-contained, thereby eliminating the need for an outside vessel or barrel. Built-in storage tanks are provided as part of the unit and its contents are said to be distilled entirely without danger of overheating, as the machine is equipped with a jacket heating system.

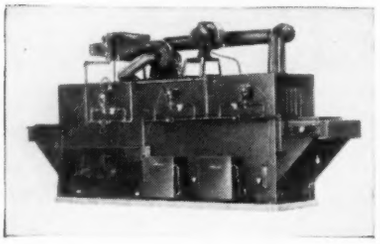
By increasing the flow of cooling air, vapor level oscillation is substantially reduced. As a result, the consumption of solvent is also reduced proportionately. An extra heater, foot pedal operated, is said to help increase the vapor formation and overcome the shock load as work is placed in the machine.

The machine is claimed to be efficient on



light metals, as a hand hose and flush pump take care of lighter gauges which do not condense enough solvent vapor for effective cleaning.

For additional information, quotations, engineering data, etc., write to the Mabor Co., Dept. MF, Clark Township, Rahway, New Jersey.



Conveyor Spray Washer

A flat conveyor type, spray washing machine, adaptable for cleaning and similar spray operations, as well as for drying, has been announced by the Optimus Equipment Co., Dept. MF, 127 Church Street, Matawan, N. J., manufacturers of metal washing and drying equipment. The new machine is designed to spray any parts which may be handled either in baskets, on racks, or simply laid on the conveyor.

The manufacturer states this type of conveyor can be adapted to many different and difficult problems; special parts can be positioned if necessary, and little labor is required for loading or servicing. Alkaline, acid, solvent type, air drying, oil spray, and many similar operations can all be handled. Any type of heating can be employed, and the machine is available in all sizes with any variety of horizontal conveyor.

The machine features a long horizontal tunnel placed on top of a series of solution tanks. A continuous flat conveyor runs the length of the tunnel, carrying parts through a series of operations.

Solutions are forced on the parts through a battery of spray nozzles by means of a pump. Machine is self-contained, but it may be connected to any other conveyor-moved operation, thus reducing parts handling to a minimum.

Emulsifiable Cleaner

Enthone, Inc., Dept. MF, 442 Elm St., New Haven, Conn., has recently developed a new type of emulsifiable solvent cleaner designated as Emulsion Cleaner EC-75. This product is recommended for the removal of oil, buffing compounds and other organic dirt, as well as solid dirt, from all types of metals including active metals such as zinc, aluminum, brass and nickel silver. One of the outstanding features of this product is that it will not harm alkali cleaners when it is dragged into them, and it is claimed to actually increase the cleaning ability of alkali cleaners.

The material is used undiluted and is a penetrating solvent to replace naphtha, kerosene and chlorinated solvents and, in addition, is said to have high detergency and emulsifiability.

A few of the many features claimed for this product are: self-dispersing and free rinsing; safe for aluminum, copper, brass, zinc, lead, iron and magnesium; cleans steel faster and avoids alkali cleaning for phosphate treatments, blackening or organic finishing; requires no heating facilities; lasts longer than simple solvents not spoiled by oil contamination.

The manufacturer will furnish literature upon request.

Tumbling Balls

Precision balls made of tungsten carbide are now being offered as a cost-saving step in the metal industry. The manufacturer claims that the balls can be furnished in any size, with any desired degree of dimensional accuracy, and in small quantities when desired.

The balls are said to be particularly useful in burnishing and polishing operations since they will retain their size for longer periods of time. In addition, their hardness in combination with corrosion resistance, is claimed to be invaluable for use in this type of finishing.

Other applications are for use in check valves, special bearings, and anti-friction mountings. For special adaptations, the balls can be furnished with holes to permit attachment of wires and cables, according to the manufacturer, who claims new manufacturing methods have made it possible to



Professional Directory

Platers Technical Service Co.
Electroplating and Chemical Engineers
Complete services, including solution analyses, process development and deposit tests.
S. C. Taormina ..... Tech. Director
Dr. C. B. F. Young ..... Tech. Advisor
59 E. 4th St., N. Y. C. ORchard 4-1778

Having trouble?
Consult us—
BEEKMAN ELECTROCHEMICAL LABORATORIES
102 BEEKMAN STREET
NEW YORK, N. Y.
Solution analysis and control. Plants set up or modernized. Research on improved methods. Consultation and servicing.
Call: BArclay 7-1897

G. B. HOGABOOM JR. & CO.
Consulting Chemical Engineers
Metal Finishing—Electrodeposition—Testing of deposits—salt spray, thickness, composition, porosity. Solution analyses, plant design, process development.
44 East Kinney St. Newark 2, N. J.
MArket 3-0055

ELECTROCHEMICAL TECHNOLOGY
E. J. HINTERLEITNER
and Associated Engineers
669 SUMMIT AVENUE
WESTFIELD, NEW JERSEY
Phone: Westfield 2-4766
NATIONWIDE — COMPLETE CONSULTING SERVICE
for the
METAL FINISHING INDUSTRY
MODERNIZATION OF EXISTING PLATING DEPARTMENTS
DESIGN AND ESTABLISHMENT
of
NEW AND MODERN PLATING DEPARTMENTS AND BUSINESSES

JOSEPH B. KUSHNER, Ch.E.
Metal Finishing Consultant
Problems in Automatic Plating, Electroforming and Plastic Plating; Plating Plants Installed.
233 W. 26th St., New York 1, N. Y.



produce tungsten carbide balls with extreme accuracy.

For further information write Industrial Tectonics, Dept. MF, Ann Arbor, Mich.

Bright Nickel Process

Featuring improvements which provide for increased operating efficiency, the New Improved Lustrebright Bright Nickel Process now being offered by the W. C. Brate Co., Dept. MF, 14 Market St., Albany, N. Y., is said to produce brilliant, lustrous, adherent deposits without subsequent color buffing or burnishing on all sizes and classes of highly colored work, by merely adding to cold nickel solution. Easy to control, the process is claimed to afford an ideal base for chromium, eliminating color buffing, recleaning, and reracking prior to the application of the chromium plate.

Designed to provide zinc die castings with a bright nickel deposit that may be chromium plated, the new process is claimed to be unharmful to cold nickel plating solutions of standard formula and to produce deposits that are not streaky and will not peel or become brittle. Described as having excellent throwing power, the process requires no special equipment but may be employed in still tanks, mechanical barrels, or automatic machines to obtain uniform results.

Face Shield

American Optical Co., Dept. MF, Southbridge, Mass., announces a new face shield to give extra over-all protection, especially on jobs such as babbitting, handling chemicals and on operations in the manufacture of high octane gas. The shield is also said to guard against impact of flying particles and splashes of acids, oils, alkalis, hot water, etc.

The extra large window, 18¾" x 10", is made from cellulose acetate .040" thick. It extends completely around the face, covering the ears. The fibre head guard protects the upper forehead and covers the entire top of



the head as an additional safeguard against injury.

The headgear is designed for comfort and long wear. The band is said to slide within a fibre sleeve in back, to permit easy adjustment to varying head sizes while a metal knob is added to allow for quick adjustment.



in acrobatics it's balance

In metal cleaning, too, *balanced cleaners* are required.

The balanced composition of Wyandotte Metal Cleaners* gives long life to solutions and permits lower concentrations, so that cleaning is economical. This balance makes Wyandotte compounds clean faster and more efficiently, resulting in economy through increased production and fewer rejects.

You get diversified applications from Wyandotte Metal Cleaners because of balanced formulas. They contain ingredients for water conditioning, saponifying, emulsifying, wetting action—plus the ingredients for a long pull. They give better rinsability.

Wyandotte Metal Cleaners give satisfaction in *all* cleaning—direct and reverse current cleaning of steel, brass, copper, magnesium, and die castings . . . still tank . . . presoak cleaning. They remove *any* soil from *any* surface in preparation for *any* finishing operation.

Let your Wyandotte Representative tell you more about the advantages of Wyandotte balanced Cleaners. He's always at your service. Just give him a call.

* TEMPORARILY IN SHORT SUPPLY

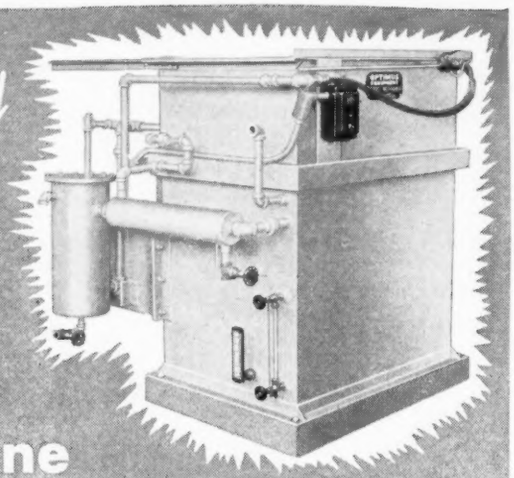
WYANDOTTE CHEMICALS CORPORATION • WYANDOTTE, MICHIGAN

Service Representatives in 88 Cities

Wyandotte

REG. U. S. PAT. OFF.

Announcing



a new complete line of Metal Parts DEGREASERS

Type OP-1-40 OPTIMUS Vapor-Spray Type Degreaser. Designed for use with trichlorethylene. Installed to degrease metal parts prior to plating. All parts of unit hot galvanized after fabrication. Heating and cooling coils readily removed. Unit acts as a still to recover salvaged solvent. One of a series of standard OPTIMUS models.

To adequately round out and complete its line of Metal Cleaning and Drying Equipment, the Optimus Equipment Company announces the manufacture and marketing of a full line of Metal Parts Degreasers.

This new equipment, which has been carefully engineered to include the latest developments in the field of vapor degreasing, will cover a wide range of applications. Equipment will be available embodying a varied number of cleaning cycles, including Vapor, Vapor-Spray, Liquid-Liquid-Vapor, Liquid-Vapor, as well as combinations of these and the use of supplementary pump and spray washing facilities, to meet special requirements.

Investigate the production savings which vapor degreasing may make possible in your metal finishing operations. Let OPTIMUS engineers submit an equipment plan specially designed to fit your needs, embodying the use of standard or special models.

SEND FOR
NEW BULLETIN

Write today on your business letterhead for your copy of new illustrated bulletin No. 651, describing OPTIMUS Equipment and Dependable OPTIMUS Detergents for modern metal parts cleaning operations.

SOLVENTS FOR VAPOR DEGREASERS—The solvents, Trichlorethylene and Perchlorethylene are available to OPTIMUS Equipment users and others in the metal finishing field, supplied from our several conveniently located warehouses.

OPTIMUS EQUIPMENT COMPANY
ENGINEERS AND MANUFACTURERS
127 CHURCH STREET, MATAWAN, N. J.

STANDARD AND SPECIAL TYPES OF EQUIPMENT FROM THE SMALLEST TO THE LARGEST SIZES FOR A WIDE VARIETY OF OPERATIONS.

OPTIMUS EQUIPMENT
FOR CLEANING · RINSING · DEGREASING · PICKLING AND DRYING OF METAL PARTS

Alkaline Cleaning Series

Announcement is made by E. F. Houghton & Co., manufacturers of oils, leathers and metal working products, Dept. MF, 303 W. Lehigh Avenue, Philadelphia 33, Pa., of a new series of metal and maintenance cleaning compounds developed as the result of a two-year study of the requirements for such products.

These are known as the Houghto-Clean 200 Series, embodying 17 different products including cleaners for maintenance work, ferrous and non-ferrous metals, for use prior to painting or vitreous enameling, electrolytic cleaners and special purpose compounds.

In formulating these products, advantage has been taken of recent developments in detergency and wetting out wherever feasible. New synthetic detergents have proven superior in many ways to soap itself and have been adapted in several of these products. New alkalis have also become available as the result of war-time research. Therefore, each of these is a new formulation and not a mere revision of former products.

The aim in developing the series was to provide increased speed and greater efficiency so that alkaline cleaning can be used in the production line with a considerable saving of time as compared to former practice.

In evaluating these cleaners, ultra violet light was used in a fluorescent test. Visual inspection of cleaned parts or the formerly accepted water-break test were not deemed sufficient to measure the comparative values of metal cleaning compounds. Reproducible results are obtained with this method of fluorescent testing. A circular describing these products and their application is available upon request.

Composition Spraying

The development of spraying composition to buffs, polishing wheels and belts has recently been announced. The process is basically one of spraying cold glue and abrasive on belts and polishing wheels which are then baked; and the spraying of liquid composition on buffs during the buffing operation to eliminate handling of composition sticks.

In recoating wheels and belts, it is claimed that by the spray method of application, a set-up man prepared 300 wheels per hour, whereas by ordinary methods, 300 wheels per day were recoated.

In spraying composition to buffs, several advantages over stick or bar applications are claimed. As much as 80% savings in composition material costs are said to be effected by the use of spray methods, due essentially to friction losses in applying by hand and by the application of unnecessarily heavy coatings when bar is being used.

Equipment required for buff spraying consists of the usual standard industrial paint spraying materials with slight changes in tips, needles and air caps, although it is stated that considerable variation can be made. For single or multiple gun applications, control can be designed for foot valves and on automatic set-ups, roller cam valves are used, and in some instances, solenoid valves.

The entire design is said to be flexible

enough to be adapted to any operation of buffing, the principle being primarily one of applying composition as a fine spray while the wheel is rotating.

For further information write J. J. Siefen Co., Dept. MF, 5657 Lauderdale St., Detroit, Mich.

Surface Finish Standards

Conforming to the preferred-number series which the American Standards Association has recently adopted for designation of surface finish, a handy pocket set of standards affords convenient means of checking surface finishes over a wide scale of roughness.

The set consists of twenty small blocks of stainless steel, each of which is accurately machined to the surface finish specified for one of the preferred-number standards. The inspector checks finish by drawing his fingernail across the specimen and across the standard. Small differences in surface finish are apparent by the feel of the surface.

The standard surfaces established by A. S. A. and the finishes furnished in the standard are: 2, 4, and 8 microinches polished; 16 and 32 microinches ground (straight and Blanchard); 63 microinches shaped, turned, and ground; 125 microinches shaped, turned, milled, and ground; 250 and 500 microinches shaped, turned, and ground. Accuracy of finish is assured by Profilemeter checks of each block.

The surface finish standards are held in a Dowmetal case, with the microinch reading and method of cut plainly shown for each block. The case is hinged and is held closed by a snap latch, 3¾" x 4⅞" x ⅝" when closed. this set of surface finish standards is said to be convenient to carry as well as to use, and should prove valuable to designers, inspectors, machinists, and others who have occasion to specify or check surface finish. Designated Type 7, this set of surface finish standards in the preferred-number series is available from Dept. MF, University Machine Company Division of Baird Associates, Cambridge, Mass.

Folding Safety Spectacles

This is a new design in industrial eye-protection equipment that was favorably received at the recent National Safety Congress. The semi-rimless type frame is hinged to fold at the bridge. A new type of hollow, stainless-steel temple telescopes to 1/3 normal length, and the entire goggle folds to the size of a pack of cigarettes.

Lenses are of shatterproof Impax plastic, resistant to high-velocity impact. Clear or green-tinted lenses are inter-changeable and are locked rigidly in the deep-channeled Plexene plastic frame.

Hinge between temple and frame will lock automatically in open position; temples are available in 3 different lengths. Of importance to industry, this spectacle is said to stay on the eyes, for its light weight is claimed to eliminate employee resistance to conventional heavy goggles. For further details write Watchemoket Optical Co., Inc., Dept. MF, Providence 3, R. I.

Hammond
OF KALAMAZOO

COSTS A LITTLE MORE...
WORTH A LOT MORE

The HAMMOND No. 3 Backstand will convert any standard Grinder or Polisher into a high production abrasive belt unit.

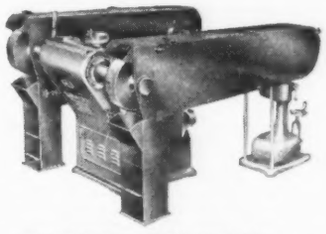
Note these "plus" features:

+ Patented spring loaded adjusting screw and hand wheel — maintains uniform belt tension while in operation. Tension easily and quickly adjusted.
+ 12" diameter by 7" face ball-bearing balanced pulley.
+ Front Control — operator can track belt at front of lathe.
+ Heavy machine tool construction — so important for smooth operation. Net weight 375 lbs. Gross weight 450 lbs.

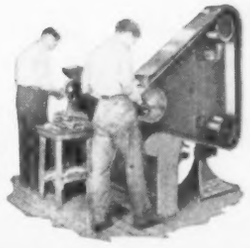
Built by America's leading producer of Grinding and Polishing (including Automatic) Machinery.

SHIPMENT FROM STOCK





HAMMOND "VRO" Variable Speed (1500 to 3000 RPM) Polishing and Buffing Lathe with two No. 3 Backstands.



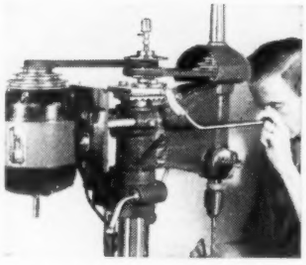
HAMMOND "VRO" Variable Speed (1500 to 3000 RPM) Polishing and Buffing Lathe with No. 4 Backstand.

Hammond Machinery Builders INC.
1601 DOUGLAS AVENUE • KALAMAZOO 54, MICHIGAN



Variable Speed Drive Attachment Offers Instant Speed Control for Drill Press Work!

Now you can adjust drill press speeds from high to low—or any intermediate speed—as easily as shifting gears in your car! The Era Variable Speed Drive Attachment enables the operator to provide the correct speed for large or small drills by merely moving a lever. This saving in time results in greater work volume, better work, and lower production cost.



Era Variable Speed Drive

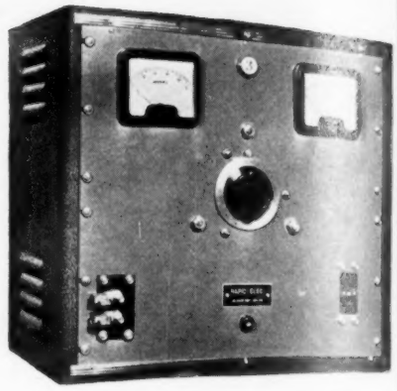
The Era Attachment fits all popular makes of drill presses, and is easily installed without the necessity of drilling holes or changing present equipment.

To also help save time on the job, many plant owners make chewing gum available to workers. Chewing gum seems to make work go easier, time go faster. Wrigley's Spearmint Gum may be used even when both hands are busy, eliminating work interruptions, and thus promoting greater safety for the operator.



You can get complete information from
Era Meter Co.
3940 N. Kilpatrick Ave., Chicago 41, Ill.

AA-205



Selenium Plating Rectifiers

A new line of selenium rectifiers designed especially for use in the plating industry has just been announced by Rapid Electrical Service.

The units are said to be conservatively rated in order to insure longer life and eliminate possible maintenance problems. Designed especially for the needs of modern electroplating methods, the line is engineered by personnel familiar with plating problems, according to the manufacturer.

The rectifiers are said to be equipped with highly sensitive and accurately calibrated instruments. For protection against overload and short circuits induced at the plating tank, a circuit breaker and fuse block are installed. Some models are equipped with thermostatic control on the selenium stack, automatically cutting off input power when overheated.

For further information write the Rapid Electrical, Dept. MF, 2849 Middletown Road, Bronx 61, N. Y.

Acid Pump

A new no pressure acid pump designed for removing acids from carboys has recently been made available. The unit is made of acid resistant material and is inserted directly into the carboy where the lifting action allows the filling of a pitcher or beaker without juggling the carboy or setting it on end on the usual rocker. It is claimed the set-up is the most efficient method of acid handling to give the maximum in safety.

A safety siphon designed along the same lines as the pump is also available. The siphon is composed of a plastic casing enclosing a piston for priming, a semi-flexible plastic siphon tube, a flow control valve and an outlet. The unit is designed for maximum safety and long life, it is claimed.

For further information write The Alden Speare's Sons Co., Dept. MF, 156 Sixth St., Cambridge, Mass.

Wire Brushes

Recently formed for the manufacture of all types of power brushes, the C. W. Morris Co., announce the availability of their standard line.

Varieties of general purpose wire brushes in sections with adapters are made for use individually or in groups. It is claimed

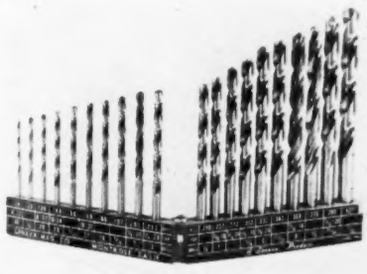
that all brushes are made on especially designed equipment to insure perfect balance.

Cup type brushes, made in several type wire sizes for flexibility, are also manufactured and are so designed as to fit the standard 2" adapter with arbor holes of various sizes. The company also makes pilot type end brushes as well as long rigid designs and various types of butterfly wire brushes. Tampico sections manufactured by the company are of ring lock construction, ½" thick, and are available in either dry or treated form.

For specifications and other information write the C. W. Morris Co., Dept. MF, 10628 Cloverdale Ave., Detroit 4, Mich.

Drill Stand

Something entirely new in drill stands has been developed to fill the need of the average shop for a handy compact stand which holds the drills used most. The drill stand holds 20 of the most commonly used tap and body drills—fractional, letter, and number



—from .106 through .437 (6-32 through 7/16 x 20). The designations under each drill show decimal, tap and drill sizes. This is said to save wasted time referring to drill tables.

The drill stand folds compactly with the drills in place and fits handily into one of the small drawers of a tool kit. Another feature is that when the drill stand is closed, the drills are held firmly in place, even though the stand is held upside-down.

Made of light-weight anodized aluminum alloy and lettered with durable baked enamel, the stand makes a practical addition to the tool kit of drill-losers. National distributor is the Glenn C. Hall Company, Dept MF, 541 S. Spring St., Los Angeles 13, Calif.

Tubular Dust Collector

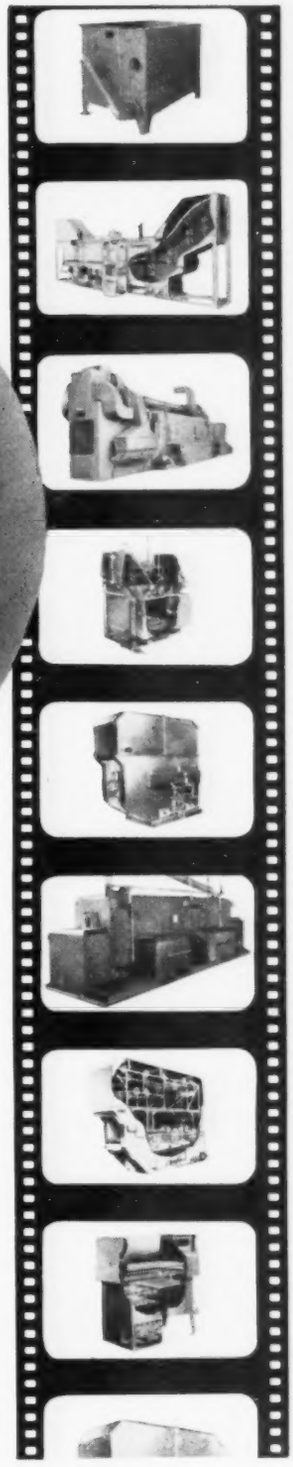
For buffing and the collection of fine dusts and lint, the Dustex tubular dust collector has been developed.

The tubular filters are not of the bag type but are bottomless; the dust is filtered through them and collected in a pan at the bottom of the unit. A hand shaker is attached to the unit to provide a method of cleaning the filters. The filter tubes are claimed to last indefinitely while the equipment is said to require a minimum of maintenance in operation.

For further particulars write the Geo. A. Stutz Mfg. Co., Dept. MF, 1645 W. Carroll Ave., Chicago 12, Ill.

STANDARD PRODUCTS PAY OFF





In Metal Cleaning

Because metal-cleaning problems differ in so many ways, a complete line of cleaning processes and products is necessary. Here is a typical specialized problem solved by TRIAD 90—a standard Detrex emulsion.

Cleaning ferrous wire is a tricky operation. For a trouble-free job, obstinate drawing compounds must be removed, rusting after cleaning must be prevented and wire lubrication must be provided. TRIAD 90 scores on all three counts.

Specialists in all phases of metal cleaning, Detrex field representatives analyze every factor before recommending the process and product for the job. And you can be sure that that product—whether a vapor degreasing solvent, an alkali, or an emulsion—is RIGHT. Do as thousands of others are doing when production is bottlenecked in the cleaning department—*call a Detrex field representative today.*

DETREX Corporation
DETROIT 32 MICHIGAN
A-132



when Costs MUST come down

turn to LIONITE

Many of our customers have reported that impressive reductions in polishing costs result when they switched to LIONITE Abrasive Grains for their set-up wheels. We have actual figures showing the savings in a variety of polishing operations. The quality of the finish is frequently improved at the same time.

LIONITE representatives have had wide experience in all phases of metal polishing. They are at your service to survey your polishing procedure and submit recommendations. There is no obligation. If you are not entirely satisfied with costs or quality in your polishing department, ask to have a LIONITE representative call.

GENERAL ABRASIVE COMPANY, INC.

Lionite and Carbonite Abrasive Grains

NIAGARA FALLS, NEW YORK, U. S. A.

Business Items

DETREX APPOINTS PROCESSING EQUIPMENT MANAGER

Detrex Corp. announces the appointment of *W. E. Gilbert* to the Sales Department as manager of the Processing Equipment Division. *Mr. A. O. Thalacker*, vice-president and general manager of the company, in making this announcement stated that



W. E. Gilbert

Mr. Gilbert's new duties will deal directly with the numerous phases of automatic cleaning and finishing machines, rust proofing systems, dip tanks and aluminum processing equipment.

Mr. Gilbert joined Detrex in February, 1939, and was soon promoted to factory superintendent of the Drycleaning Division. In 1941, he was appointed plant superintendent in charge of all equipment fabrication, a position which he held until his recent transfer.

Mr. Gilbert brings to his new position considerable experience in manufacturing and field erection work. He will be stationed at the main office and plant headquarters at 14331 Woodrow Wilson Ave., Detroit, Mich.

CHEMICAL CORP. NAMES GARDNER

The Chemical Corp. of Springfield, Mass. announces that *Bryant H. Gardner* has joined its organization in the newly created post of advertising and sales promotion manager.

Mr. Gardner came from *Wm. B. Remington, Inc.*, where he was an account executive. Prior to this he spent fourteen years in the radio and advertising fields.

Expanded operations in the chemical specialty line and new products planned for early introduction, it is said, made advisable the creation of a company advertising department.

Besides a general line of heavy industrial chemicals, the company's principal products are an inhibited zinc bright dip, nickel

stripping acid, industrial hand soap, skin protectors and cleaners, detergents, and sanitary chemicals.

BENNER GOES TO GERMANY

Dr. Raymond C. Benner, consulting engineer, formerly director of research of the *Carborundum Co.*, is at present in Germany, where he is acting as consultant on matters of reparations.

RANSOHOFF CHANGES OWNERSHIP

A change has been made in the ownership of *N. Ransohoff, Inc.*, Cincinnati, Ohio. John R. Strauss has purchased controlling interest, and will engage in the active management of the firm.

N. Ransohoff, Inc. has been well known in industrial circles ever since its organization in 1916 to produce metal cleaning machinery of various kinds. At the outset of World War II the company engineered and produced automatic continuous phosphate coating machines for handling metallic links and Garrand clips.

They also are the producers of the *Packless Centrifugal Pump* which is used in metal cleaning equipment, and *Uni-Drain* which combines all drains in the machine into one common drain leading to the sewer.

The new officers of the firm are *Nathan Ransohoff*, president, who will devote his entire time to engineering and development, *John R. Strauss*, vice-president and treasurer, *Richard C. Wigger*, secretary and general manager. *Mr. Freiberg* has retired from active business and will devote himself to his private interests.

TWINS SERVE SAME INDUSTRY

Edward F. and *Edwin A. Stack* are twins born in Chicago in 1913, graduated in chemical engineering from Notre Dame in the class of '39 and now are both serving the same industry.

Edward is technical sales representative for *MacDermid* in the Chicago territory, while Edwin, after being released from the Army, has joined the *Udylite* organization and is serving also in the Chicago area.

Both are members of the American Society for Metals and the American Electroplaters' Society.

9 Months of Service in Copper, Nickel, Chromium — and

STILL NO SIGNS OF BREAKDOWN!

UNICHROME
RACK COATING 203
can take it in strong doses!

No breaks, no blisters, no peeling—Unichrome Coating 203 was still in good shape after nine solid months in copper, nickel and chromium plating baths, and the usual cleaning cycles! This report of extra service from one plater bears out what so many others have also discovered—that Coating 203 saves time and money.

No wonder Unichrome rack coatings are such favorites with metal finishers. Specially developed from synthetic resins, Coating 203 is flexible as well as tough and adherent—resists not only the hot, strong solutions, but shop handling too. It's easy to work with. Simply dip, brush or spray, and hang up to dry. Let it prove to your own satisfaction how you too can get outstanding service. Write your nearest Unichrome office for details.



For Force Drying—
UNICHROME RACK COATING 202
It provides all of the chemical resistance and mechanical strength of Coating 203, in addition to extra adhesion from force drying.

UNICHROME

PROCESSES AND MATERIALS
FOR SURFACES THAT SURVIVE

Chromium Plating • Porous Chromium • Unichrome* Copper • Unichrome Lacquers • Ucilon* Protective Coatings • Unichrome Stop-Off Lacquers and Compounds • Unichrome Dips • Unichrome Rack Coatings • Anozinc* Compounds • Unichrome Strip

*Trade Mark Reg. U.S. Pat. Off.

UNITED CHROMIUM, INCORPORATED
51 E. 42nd St., New York 17, N. Y.
Detroit 7, Mich. • Waterbury 90, Conn. • Chicago 4, Ill. • Dayton 2, Ohio • Los Angeles 11, Cal.



Edward F. Stack



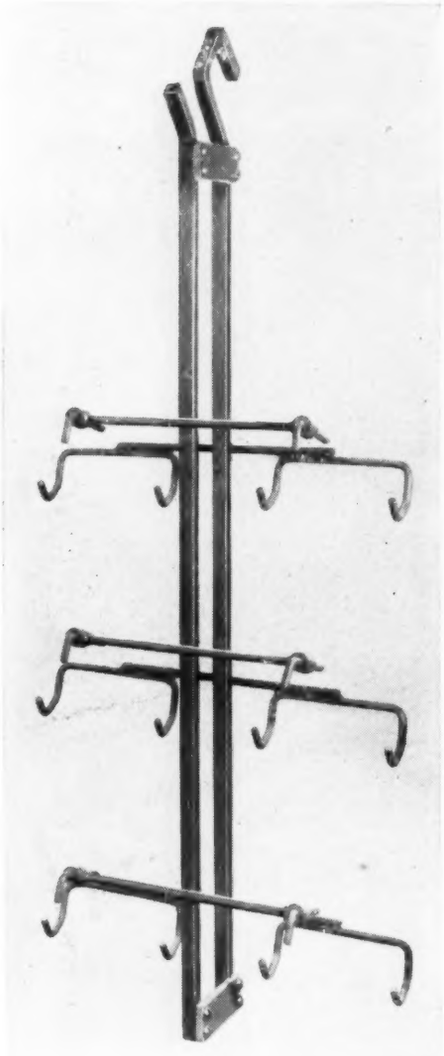
Edwin A. Stack

H-VW-M Expands Personnel

The *Hanson-Van Winkle-Munning Co.*, Matawan, N. J., announces a number of additions to and changes in its technical, sales and service staffs. The increased personnel will aid the company in providing wider and better service to their customers.

Paul J. Lalonde has been transferred from chemical research activities to engineering service and development for the electrotypers' and stereotypers' industry. He is a graduate of Rensselaer Polytechnic Institute with a degree of Ch.E., and has had wide experience as a member of the technical staff of the firm.

Dr. Otto Kardos has been assigned to the post of research electrochemist for the



Rack by J. J. Siefen Co., Detroit

Easy to Patch

Racks do require repairing and, unless you are using an insulation that is easily patched, each repair means re-insulating the entire rack.

BUNATOL rack insulation sticks to itself so repairs are merely a matter of cleaning the patch and brushing or pouring on new insulation to complete the repair. The patch makes a continuous film that rinses freely and gives perfect insulation.

BUNATOL is the low cost insulation for use on all types of electroplating racks. It's free dipping and requires a minimum of labor to apply. It has the toughness and resistance for long insulation life and a permanent flexibility which permits insulation of spring contacts.

May we send you complete information?

NELSON J. QUINN COMPANY
TOLEDO 7, OHIO

BUNATOL



Paul J. Lalonde



Dr. Otto Kardos



D. Gardner Foulke

study of plating solutions. Dr. Kardos received his Ph.D. in chemistry from the University of Vienna and served for a number of years as chief chemist of *Galvapol* in that city. Later he was engaged in the chemical and electrochemical fields in France and the United States, prior to joining the H-VW-M organization.

D. Gardner Foulke has joined the technical staff as a process electrochemist. Dr. Foulke received his B.S. in chemistry at Juniata College and an M.S. and Ph.D. at Rutgers University. Until recently he was director of the Analytic Laboratory of *Foster D. Snell, Inc.* He had previously had wide experience in the chemical and electrochemical fields. He is a member of the American Electroplaters' Society, the Electrochemical Society, the American Society for Metals, the A.S.T.M. and the American Chemical Society.

EASTERN ENGINEERING CONSOLIDATES

Eastern Engineering Co., New Haven, Conn., manufacturers of midget pumps for industrial and laboratory use and of industrial mixing equipment, has been consolidated with *Automatic Signal Corp.*, East Norwalk, Conn., makers of automatic traffic signals and relays.

The new corporation is *Eastern Industries, Inc.* Personnel of both operating divisions will remain substantially the same under the new organization and will continue to manufacture the same products but with greater production, sales and financial facilities.

FLUG JOINS BART-MESSING

Benjamin S. Flug has recently joined the *Bart-Messing Corp.*, 41 Park Row, New York 7, N. Y., marketers of chemicals and metals. He will be connected with the sales and technical service sections of that organization and will be stationed in the metropolitan New York territory.

Mr. Flug was formerly chief chemist and plating supervisor at the *Grand Rapids Brass Co.*, Grand Rapids, Mich.



Myron Norman

NORMAN APPOINTED BY L. H. BUTCHER CO.

The L. H. Butcher Co. announces the appointment of *Myron Norman* to the staff of the Metal Plating and Polishing Division in its Los Angeles office.

Mr. Norman is a graduate of the Massachusetts Institute of Technology of '39 with a Bachelor of Science degree in electrochemical engineering. He became associated with the Aerovox Corp. as assistant to the electrochemical engineer.

For the six years immediately prior to his present connection, Mr. Norman was actively engaged with the Navy Department in electronics engineering on the east coast. In addition, he later became project engineer in charge of certain phases of the development and production of infrared signaling and detection equipment extending from the research and laboratory stages to the metal finishing in the final production.

APOTHECARIES HALL ANNOUNCES ADDITIONS

Apothecaries Hall Co., Waterbury, Conn., manufacturers and distributors of industrial chemicals, plating supplies and equipment, announce the appointment of *Theodore Voyda* as chief chemist, effective November 4th.

Mr. Voyda holds the degrees of B.S. and M. S. from the University of Connecticut where he graduated with distinction in chemistry. For the past seven years, he has been employed in the materials laboratories, Engineering Department of Pratt & Whitney Aircraft Co. Here he was in charge of research and development in plating and metal processing, manufacturing problems including trouble shooting on production cycles of copper, cadmium, lead, indium, tin, silver plating, anodizing, metal cleaning and processing, and experimental and pilot plant plating, including extensive work on plating installations of nickel, chromium, silver, copper, lead and others.

In his new position he will be in charge of laboratory research, development of the

3 FAST DRYING STOP-OFFS



THAT HELP CUT PREPARATION TIME

Dry at Room Temperature in 5 to 15 Minutes!

The fast-drying properties of Unichrome stop-off lacquers permit substantial increases in plating output by minimizing the time required for preparing the work for production. Initial coats dry in 5 to 10 minutes—final coat, 15 minutes. They're easy to apply too, by conventional methods of brushing, spraying or dipping.

As the result of years of research and detailed studies of actual plating-room requirements, the Unichrome Laboratories have developed these *three* stop-off lacquers—each designed to offer maximum convenience and performance under specific conditions.

All assure clean-cut edges—withstand hot cleaners and acid dips—and will not contaminate plating baths.

Write for prices and data.

"Quick Dry" Stop-Off 322 (Black)—Excellent for severe plating cycles, including those containing hot cyanide solutions. Can be dissolved in Unichrome Remover 322-RA.

"Quick Dry" Stop-Off 323 (Red)—Excellent for Chromium and other moderate temperature plating. Can be readily pulled off in large sheets at room temperatures.

"Quick Dry" Stop-Off 324 (White)—Excellent for hot cyanide silver and copper solutions. Resists hot electrolytic alkaline cleaners—vapor degreasers for limited time. Can be peeled off while work is still warm.

UNICHROME

PROCESSES AND MATERIALS FOR SURFACES THAT SURVIVE

Chromium Plating · Porous Chromium · Unichrome* Copper · Unichrome Lacquers · Ucilon* Protective Coatings · Unichrome Stop-Off Lacquers and Compounds · Unichrome Dips · Unichrome Rack Coatings · Anozinc* Compounds · Unichrome Strip

*Trade Mark Reg. U.S. Pat. Off.

UNITED CHROMIUM, INCORPORATED
51 E. 42nd St., New York 17, N. Y.
Detroit 7, Mich. • Waterbury 90, Conn. • Chicago 4, Ill. • Dayton 2, Ohio • Los Angeles 11, Cal.



Theodore Voyda



John S. Holley



METAL FINISHERS...

You Can Depend on

Du-Lite

The name, Du-Lite, is your guarantee of not only consistently dependable quality in metal finishing chemicals, but also easily workable processes for finishing. No Du-Lite process is ever offered to you until it is proved, by actual tests under normal operating conditions, that it will do the work for which it is intended.

Du-Lite is continually developing through laboratory research better finishes to be applied on metals—but metal finishers can be sure that none of these new Du-Lite products or processes will be released for commercial use until Du-Lite's own severe standards have been met.

If you have a production problem in chemical finishing of metals, solve it right—with Du-Lite.

DU-LITE CHEMICAL CORPORATION

DEPT. A - - - - - - - MIDDLETOWN, CONNECTICUT

company's manufactured line and will supplement the work of the sales force by working with them in a special and technical service capacity. Mr. Voyda's association with this company should materially strengthen its technical research department and will be reflected in the form of improved consulting service to the trade. He has a thorough knowledge and practical working experience in plating and allied lines.

Mr. Voyda is a member of the A. E. S. and present president of the Hartford, Conn. chapter.

John S. Holley has been associated with Apothecaries Hall Co. since August 1st of this year. He represents them in a sales and special service capacity and his speciality is electrical plating equipment.

Mr. Holley graduated from M-I-T in 1935 with the degree of B. S. in electrochemical engineering. Prior to his present employment he worked in one of the laboratories of *Scovill Mfg. Co.* as a control chemist. His proclivities include practical mechanics and his training will be helpful in the development of plating equipment sales.

He was on active duty with the U. S. Army in the Coast Artillery Corps between 1941 and early 1946.

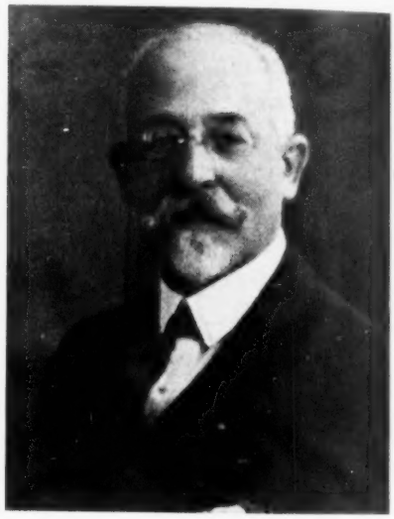
CLARENCE G. BACKUS RETIRES

After sixty years in the metal finishing field, Clarence G. Backus has recently announced his retirement, moving from his New York home to 55 Birch St., Greenfield, Mass.

Mr. Backus' early training in chemistry was obtained in the laboratory of the Montague High School, and his practical experience was begun at the Millers Falls Co., Millers Falls, Mass., and a large cutlery company at Turners Falls, Mass. At this time the plating generator was just beginning to supersede the old-fashioned battery as a source of current, and the Adams patent solution of nickel was becoming known.

For several years thereafter he was successively foreman of the finishing department at the Florence Sewing Machine Co., the American Sewing Machine Co., the Siemens Lungren Co., Thackera Mfg. Co., and as factory superintendent of Ledig Mfg. Co., and De Kosenko & Hetherington Co., Philadelphia, Pa.

In 1906, Mr. Backus went to New York City as factory manager for Zucker & Levett & Loeb Co., remaining with them until the company went out of business upon the death of its president, Mr. Charles Loeb. Mr. A. P. Munning formed a new company to carry on this line of business under the name of Munning, Loeb Co. The metropolitan office was placed in charge of Mr. Backus, who held this position during the various changes in name made by the company. The firm decided to obtain further information on trade and manufacturing in Japan and China, and Mr. Backus was sent there for this purpose in 1923. He carried letters



Clarence G. Backus

of introduction from Calvin Coolidge, then vice-president, and Charles E. Hughes, then secretary-of-state. In Osaka, Japan, he gave a lecture on electroplating at the Trade School, and at the government school in Tokyo he gave the same lecture upon request of the Japanese government.

In 1927, the A. P. Munning Co., sent Mr. Backus to England and France on problems relating to automatic plating and conveyors. In 1932, for a period of 18 months, he acted as foreman of the plating department of the American Safety Razor Co., of Brooklyn, where the plating was done on completely automatic equipment.

In 1936 he joined Munning & Munning, Inc., and was placed in charge of their metropolitan office, remaining there until his retirement this year.

CHARLES BOLL JOINS UDYLITE

Charles Wykoff Boll, Jr., has become a member of the staff of the New York office of the *Udylite Corp.* of Detroit. He will operate in Virginia, Maryland, Delaware and part of Pennsylvania.

Until recently Mr. Boll was in the Marine



Charles Wykoff Boll, Jr.

Corps, stationed in that organization's plating shops at Washington, D. C. There he served as assistant metallurgist and plant chemist.

Before entering the service he was chemist with the *Harrisburg Steel Corp.* He is well known in Pennsylvania engineering circles.

ALCOA ELECTS MAGEE

Frank L. Magee, general production manager for *Aluminum Company of America*, has been made a vice president of the company. He will continue in his present duties, reporting to *I. W. Wilson*, vice president in charge of production .

Mr. Magee is in his 30th year with Alcoa. He joined the company in 1917 as a sales apprentice. During World War I, he served as a sergeant in the U. S. Army Signal Corps. His experience with the company has covered both sales and operation. He continued in sales work in various company sales offices until 1937 when he left the district managership of the Atlanta sales office and went to Pittsburgh to become manager of sheet sales. In 1943, Mr. Magee became general production manager and assistant to vice president I. W. Wilson.



Frank L. Magee

Mr. Magee is a native of Pennsylvania and a graduate of Lehigh University in electrical engineering.

E. A. TICE JOINS INTERNATIONAL NICKEL

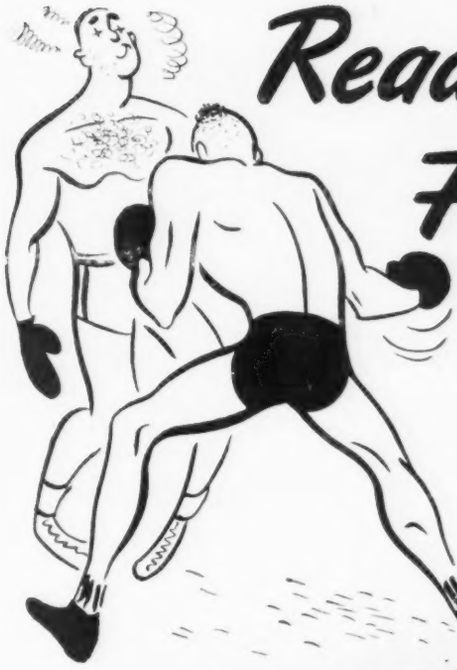
E. A. Tice has joined the Corrosion Engineering Section of the Development and Research Division of *The International Nickel Co., Inc.*, at New York, as a corrosion engineer.

He was previously associated with *Bethlehem Steel* in their Research Department as an engineer in the field of corrosion, and graduated from Rensselaer Polytechnic Institute in 1939 with a B.S. Degree in Chemical Engineering.

Mr. Tice is a member of the American Society for Testing Materials, the National Association of Corrosion Engineers and the Electro-Chemical Society.

AMERICAN FOUNDRY EQUIPMENT NAME CHANGED

The name of the 38-year old *American Foundry Equipment Co.*, of Mishawaka, Ind.,

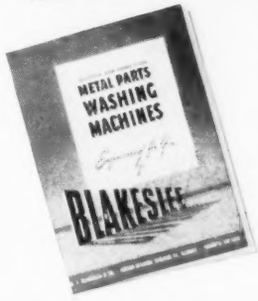


Ready for the Finishing Touch!

. . . METAL PARTS ARE MORE EASILY FINISHED WHEN CLEANED IN A

BLAKESLEE

METAL PARTS WASHER



Write today for FREE booklet on Blakeslee Metal Parts Washers to answer your particular cleaning problems.

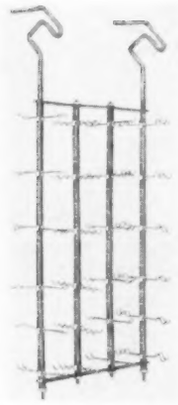
Whether the finishing operation is enameling, lacquering, machining, plating or inspecting, your washer must do a perfect cleaning job. The Blakeslee Metal Parts Washer is especially adaptable for cleaning between operations and prior to inspection . . . Continuous and batch type metal parts washers are familiar equipment throughout the automobile and aviation industries, as well as all other metal fabrication fields.

G. S. BLAKESLEE & CO.

BLACOSOLV DEGREASERS AND SOLVENT

NIAGARA METAL PARTS WASHERS

G. S. BLAKESLEE CO., CHICAGO 50, ILLINOIS
NEW YORK, N. Y. TORONTO, ONT.



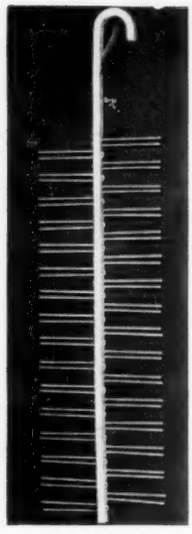
NEW • MODERN • EFFICIENT

SPECORAK

PLATING RACKS

Save Labor, Time, Material, Current

Designed by Special Chemicals Plating Engineers. These racks fill a long felt want of industrial, jewelry, novelties and other metal manufacturers for plating racks as standard equipment that can be insulated



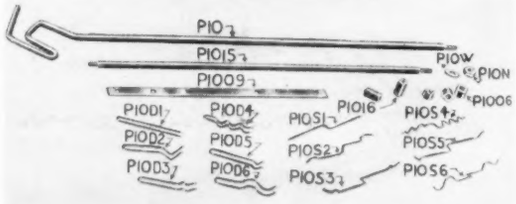


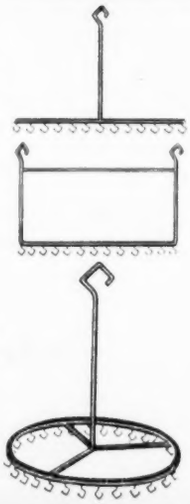
- Indispensable for plating Nickel, Chromium, Rhodium, Gold, Silver, etc. Equally economical for lower priced plating materials.
- Made in variety of standard sizes and shapes.
- Cost less than to build your own.
- Assure constant economy and efficiency of operation.
- Reduce losses to a minimum.
- Increase output capacity with no increase in power.
- Speed up loading and unloading.
- For most any size or shape tank.

The new design of SPECORAK is of quick assembly type. All parts are separate units, can be assembled into custom made rack in 5 minutes time. Assembling the various parts, placing in a vise and tightening the nut gives a finished rack except for coating. SPECORAK standard parts are always reusable for redesign.

SPECORAKS start saving you money the very first day you start using them.

Send for illustrated descriptive folder.





SPEC

SPECIAL CHEMICALS CORP.

30 IRVING PLACE, NEW YORK 3, N. Y.

has been changed to *American Wheelabrator & Equipment Corp.*, according to an announcement made by *Otto A. Pfaff*, president. The new name is more appropriate, Mr. Pfaff pointed out, because one of the principal products of the company is the Wheelabrator, developed by the company and used for cleaning and finishing metal products in many fields.

ONE-HUNDREDTH UNIT

In almost exactly two years the *Udylite Corp.* of Detroit, Mich., has produced and shipped one hundred automatic plating machines. The units have been purchased by platers in fifteen different states from coast to coast for use in fourteen different processes, to be used on a wide range of plated parts. The machine shown here is loaded on a fifty foot car.



KELITE PRODUCTS APPOINTS RAWLINGS

Harry L. Smith, vice-president of *Kelite Products, Inc.*, manufacturers of industrial cleaning materials, recently announced the appointment of *T. W. Rawlings*, as sales promotion manager. Mr. Rawlings will handle all sales promotion activities, and replaces *Allen W. Schmidt* who organized the department.

Spending over 20 years in advertising and promotion, Rawlings can name many successful associations and ventures—various departments and companies of *General Motors* in art and promotional activities; his own



T. W. Rawlings

Detroit advertising and art service; wartime service as production illustration expert on B29 and jet-propelled aircraft; and finally as a designer and illustrator with *Tivit Products Co.*, a Kelite subsidiary.

HOUK APPOINTED BY MICCRO PRODUCTS

George R. Houk was recently appointed appointed eastern sales representative for the *Michigan Chrome and Chemical Co.*, 6340 E. Jefferson Ave., Detroit, Mich., and he has offices at 93 Ridge Rd., Hamden, Conn.

Mr. Houk's activities cover the New England states, Eastern New York and Eastern



George R. Houk

Pennsylvania. He has been instrumental in broadening the list of distributorships in this area for the sale of the many *Miccro* products used throughout the plating industry.

Mr. Houk was graduated with honors in Business Administration from Wayne University in Detroit, receiving the Key as outstanding student in his class. He entered the Army in August, 1941, and at the age of 25 was appointed Major, one of the youngest officers with that rank in the United States Army Aircraft Ground Forces.

Manufacturers' Literature

Emulsifiable Solvent Cleaner

A four-page bulletin has been issued by *Enthone, Inc.*, Dept. MF, 442 Elm St., New Haven, Conn., describing a new emulsifiable emulsion cleaner claimed to be safe for use in the plating room to act as a precleaner on all types of metals. Advantages and method of using this product are described.

Polishing Equipment

Bulletin B2a, illustrating their polishing, buffing and grinding equipment, has recently been released by *The Standard Electrical Tool Co.*

Nine models of infinitely variable speed buffer-polishers are shown, ranging from the 1 H. P. bench model to the heavy duty 15 H. P. model. Snagging grinders and other type motor driven grinding equipment are given. The new abrasive belt backstand idler is illustrated and operating conditions explained. The *Speedial* control manufactured by the company is a standard part of each piece of equipment, instant and constant control for any spindle speed from 1500 to 3000 RPM being claimed by use of the dial knob. To obtain a copy of this folder write The Standard Electrical Tool Co., Dept. MF, 2488 River Road, Cincinnati 4, O.

Emulsion Formulas

A new edition of its famous book on emulsions is now being offered by *Carbide and Carbon Chemicals Corp.*, a unit of *Union Carbide and Carbon Corp.* The 72-page book presents over 113 practical formulas and methods for preparing cosmetic and industrial emulsions of oils, waxes, fats, and greases. Extensive additions and revisions have been made to the material given in previous editions, including description of the uses of *Tergitol* wetting agents, *Carbowax* polyethylene glycol emollients, and *Cellosize* hydroxyethyl cellulose thickener in new emulsion formulas. The book also describes the use of many of the recently developed amine soaps and cationic dispersants which have become commercially popular as emulsifying agents. Copies may be obtained without charge from any district sales office of Carbide and Carbon Chemicals Corp., or from its principal office at 30 E. 42nd St., New York 17, N. Y.

Stop-Off and Insulating Materials

A new price list covering all their organic coatings has recently been released by *Unichrome.* Conditions and terms are given, and the entire field of coatings manufactured by the company are listed. Included are rack coatings, stop-off lacquers, wax type stop-off compounds, solid insulating materials.

To obtain a copy of this list write to *United Chromium, Inc.*, Dept. MF, 51 E. 42nd St., New York 17, N. Y.

HOW TO BEAT THE GLUE SHORTAGE

. . . and step up your polishers' production, too!

HERE IS one shortage that actually can give your production a *lift!* It's easy: Take the bull by the horns. Say goodbye to glue. Switch to new, modern GRIPMASTER — the amazing, *patented* polishing wheel cement that boosts polishers' production an average of 47% *more* pieces per head! GRIPMASTER contains a secret new high heat resisting ingredient. It does not "glaze" on the wheel. One grade grips *all* grains—250 to 20. GRIPMASTER is the *only* patented polishing wheel cement available!



IMMEDIATE SHIPMENT!

GENEROUS FREE SAMPLE

GRIPMASTER Patent 2408946 POLISHING WHEEL CEMENT

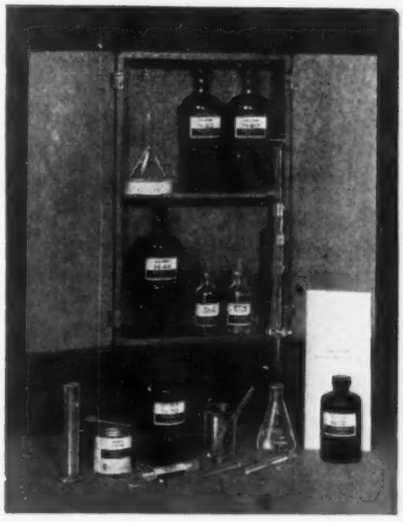
A few jobber territories still available.

GRIPMASTER DIVISION
Nelson Chemicals Corporation
(formerly Michigan Bleach & Chemical Co.)
12345 Schaefer Highway—Detroit 27, Michigan

IN CANADA:
Nelson Chemicals Corp.
Windsor, Ontario

Please send us a generous free sample of Gripmaster.

COMPANY_____
ATTENTION_____
ADDRESS_____
CITY_____ STATE_____



CHROMIUM
NICKEL
COPPER

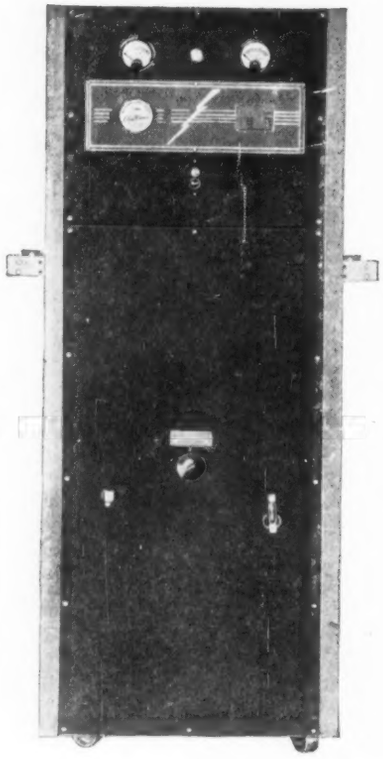
Simple test sets for controlling these and other solutions available.

Write for Literature

KOCOUR CO.
4802 S. ST. LOUIS AVE.
CHICAGO 32

Specify Kocour Sets from your supplier.

Speed up and improve ELECTROPLATING *with the* R-A SELENIUM RECTIFIER



9 volts	2000 amperes
9 volts	1500 amperes
9 volts	1000 amperes
9 volts	500 amperes
18/9 volts	500/1000 amperes
6 volts	2000 amperes
6 volts	1500 amperes
6 volts	1000 amperes
6 volts	500 amperes
12/6 volts	500/1000 amperes

Make your selection of these completely self-contained Selenium Rectifiers with meters, off-on switch and stepless variable control. Standard units can be used in multiple arrangements to obtain 5000 and 10,000 amperes or higher.

Write Today for the R-A Way

RECTIFIER DIVISION

RICHARDSON-ALLEN CORPORATION

15 West 20th St. New York 11, N. Y.

Quality and Uniformity at All Times

HARRISON 4-A PRODUCTS

For cutting, cut and color, or minor finishing, our superior compounds are faster cutting, more economical, and increase production. They are thoroughly dependable for all regular requirements.

New Compounds for Either Spraying or Dipping

Cement and Thinner

Buffing Compounds

Stainless Steel Polishing Compounds

Double Header Compounds
Sizes — 150 - 180 - 220 - 240 - 320

Consult us, without obligation, on your special problems. We will be glad to send samples of compounds that will meet your particular requirements. Write us to-day.

HARRISON & COMPANY—HAVERHILL, MASS.

Acid Metal Cleaner

A new pamphlet, recently issued, explains the *Ferr-o-niel* and *Galv-A-niel* acid metal cleaners designed for cleaning ferrous metal, galvanized surfaces, zinc die castings and cadmium plated parts.

Operating conditions are given and the type of equipment required for use with the cleaner is explained. The material is a phosphate type cleaner and the chemical action as well as the anti-corrosive properties are described.

Costs with conventional type cleaners are compared, and the advantages and features listed.

To obtain a copy of this booklet, write *Nielco Laboratories*, Dept. MF, 1632 W. Lafayette, Detroit 16, Mich.

Carbon Brushes

A new 41-page catalogue describing motor and generator brushes, and carbon products has recently been published by the *Speer Carbon Co.* By far the greater part of the contents are devoted to brushes for various types of rotating electrical equipment.

Characteristics and complete description of standard grades of carbon brushes are listed together with installation techniques. Profuse data give methods for ordering brushes and considerable space is devoted to brush calculations. Recommendations for simplified practice are given together with the various fields of application. Shunts, terminals and other supplementary adjuncts are explained. The book is interestingly presented and represents a wealth of information on brushes.

To obtain a copy, write Speer Carbon Co., Dept. MF, St. Marys Pa., requesting catalogue number 25.

Industrial Coating Applications

A visual index showing industrial applications for the different types of Bitumastic protective coatings has just been published. A subsidiary of the *Koppers Company, Inc.*, the firm markets its products under the trade names *Bitumastic* and *Bituplastic*.

The center page of the index contains a large composite drawing of a factory showing where the products can be used to advantage in prevention of corrosion. The guide provides a handy checking arrangement whereby plant managers can readily determine the correct coating to protect their buildings and plant equipment.

Copies of the index may be obtained by writing to *Wailes Dove-Hermiston Corp.*, Dept. MF, Westfield, N. J.

Aluminum Pickling

A new process, said to eliminate the acid hazards present in conventional bright dip formulae, has been perfected for pickling aluminum and aluminum alloys, according to a technical bulletin issued by the testing laboratories of the *Waverly Petroleum Products Co.*

The bulletin reports that by using their material in place of standard acids, a solution can be made up that is entirely safe, yet

produces bright, clean metal surfaces within the time required by conventional pickling solutions.

The bulletin cites instances where *Troxide-E* has been used with great success. Among these is a case where a company engaged in stamping rings out of 24 SO and 17 SO Alclad alloy obtained a bright finish by buffing. By using their solution, it is stated, this company obtained a surface so clean that the buffing operation was speeded up three times.

Copies of this bulletin can be obtained by writing directly to Waverly Petroleum Products Co., Dept. MF, Drexel Bldg., Philadelphia 6, Pa.

Dust Collector

Suggestions on installing individual dust collectors for collecting dust, lint and rouge from polishing, buffing and metal coloring operations, are contained in bulletin No. 392 available from *Aget-Detroit Co.*, Dept MF, Ann Arbor, Mich.

The bulletin, entitled *Dustkops Stop Dust and Lint from Polishing and Buffing*, contains illustrations of typical installations of *Dustkop* dust collectors, and dimensions and prices of the Model 1150 unit, in addition to an indication of heat savings possible with recirculating type collectors.

Deburring Equipment

A new folder illustrating the deburring and finishing unit manufactured by *Almco* has recently been released. The machine is designed for use with the *Honite* abrasive process for direct cutting action by tumbling methods.

The cover displays a number of parts processed in the equipment. It is claimed that although the parts had been precision machined, they were deburred and finished to within 0.0002 inch. Several photos show the tumbler from various angles. A special hoist pan and electric power screen designed to operate directly under the barrel are illustrated, while the two-compartment hopper for abrasive as well as a unique 500-lb. electric hoisting unit for use with the tumbler are shown, in addition to considerable descriptive material.

To obtain copies of this pamphlet write to Almco, Inc., Dept. MF, 556 High St., Newark, N. J.

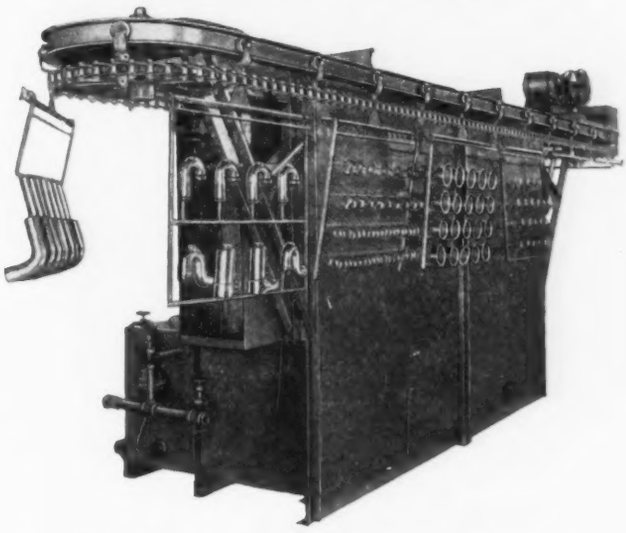
WAA Sales Information

A new booklet, issued by the *War Assets Administration*, tells "*How, What and Where*" to buy government surplus property.

The priorities accorded veterans and other groups and their buying procedure are explained. Also, the booklet tells all prospective purchasers, commercial trade as well as priority groups, where to get detailed information on sales. It lists the sales offices of WAA and other domestic disposal agencies with addresses and telephone numbers. Certification offices for veterans and small business are also listed.

The booklet may be obtained by writing to the Office of Information, War Assets Administration, Washington 25, D. C.

METALWASH



Automatic Tripoli Remover

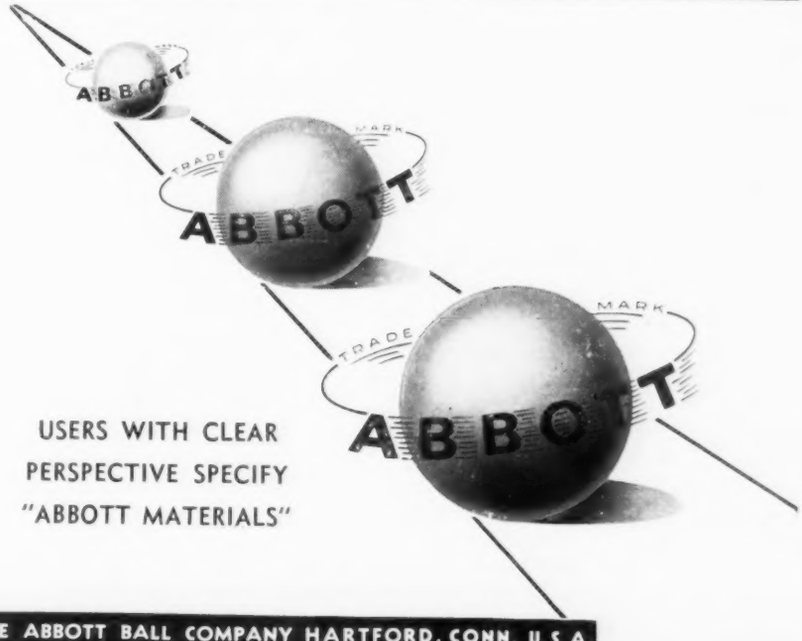
for Cleaning Parts Prior to Plating or Lacquering

- Automatically removes tripoli, rouge, etc. leaving clean, break-free surfaces.
- No hand wiping to remove smut.
- Can be furnished with spotless dryer, to suit existing conveyor or automatic plating machine.

METALWASH MACHINERY CO.

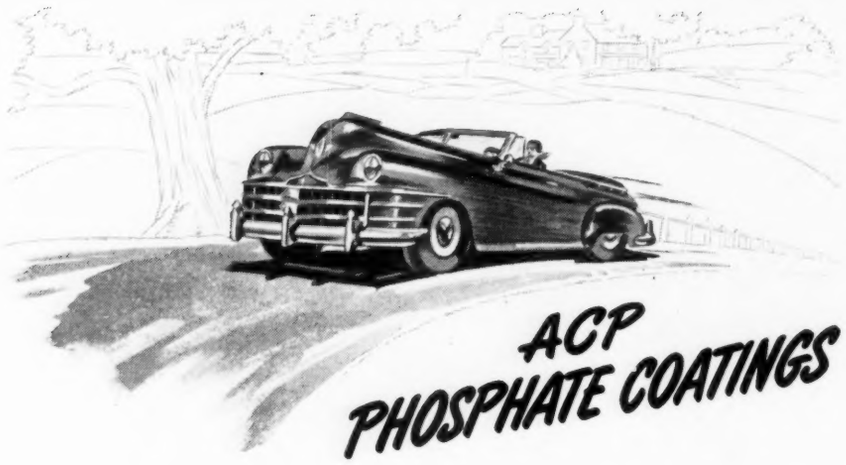
149-155 Shaw Ave. • Irvington 11, N. J.

WASHING, PICKLING AND DRYING EQUIPMENT



USERS WITH CLEAR PERSPECTIVE SPECIFY "ABBOTT MATERIALS"

THE ABBOTT BALL COMPANY HARTFORD, CONN. U.S.A.



Positive Protection For Painted Metal Surfaces



ACP Phosphate Coatings produce an excellent paint-bonding surface on metal parts and provide a foundation for a lustrous and lasting finish. There are various types depending on the kind of metal, its condition and the purpose for which it is to be used as well as the equipment facilities of the manufacturer.

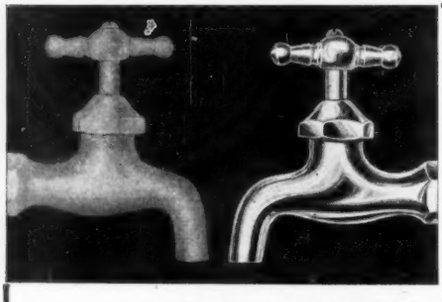
Cold **SPRAY-GRANODINE** in a short spray time forms a uniform, smooth, zinc phosphate coating — a superior base for lustrous, enduring paint finish. Cold Spray-Granodine is of special interest to fabricators of automobile bodies, fenders, refrigerators, cabinets and in general for proper preparation of sheet steel products for *durable, lustrous finishes.*

DURIDINE *simultaneously cleans and deposits a thin, tight, close-grained phosphate coating* on ferrous surfaces which provide the proper surface preparation for durable paint finish. The Duridine process is simple, economical and effective. Present spray washer installations of mild steel are adequate.

THERMOIL-GRANODINE used in an immersion process creates on steel an oil-absorbing, paint-bonding, crystalline coating of iron and manganese phosphate, integrated with the base metal. Treated surfaces, when oiled or painted, provide excellent protection against rust. Thermoil-Granodine furnishes excellent rust protection for tools, nuts, bolts and unpainted replacement machine parts.

ACP Technicians will gladly consult with you and recommend the products and processes which will most efficiently meet your requirements.

AMERICAN CHEMICAL PAINT CO.
AMBLER ACP PENNA.



New Improved
LUSTREBRIGHT
Bright Nickel
Process

Produces Brilliant, Lustrous Nickel Deposits.
Eliminates Color Buffing—Re-Cleaning—Re-Racking.
An Ideal Base for Chromium. Excellent Throwing Power.
No Special Solutions or Changes in Equipment Required.
Easy to Control—Low in Cost—Successful—Practical.

Uniform results obtained on all classes of work in still tanks or mechanical barrels. Excellent for zinc die-castings. Any cold nickel solution of standard formula will with the addition of NEW IMPROVED LUSTREBRIGHT give brilliant, lustrous, adherent deposits. Guaranteed not to harm plating solution. Will not cause plate to peel, become brittle or produce streaky deposits. Illustration shows unbuffed deposits produced before and after addition of NEW IMPROVED LUSTREBRIGHT. Write for complete information.

W. C. BRATE COMPANY
14 MARKET ST. *Est. 1860* ALBANY, NEW YORK

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

LOS ANGELES BRANCH

Some of the problems entailed in attaining satisfactory surface finish control for Norden bomb sights and instruments of a similar nature manufactured for the Navy were related at the November 11th meeting of *Los Angeles Branch, A.E.S.*, by *J. M. Cosgrove* of the *Naval Ordnance Test Station*, Inyokern, Calif.

The title of Mr. Cosgrove's talk was *Metal Surface Finishes.* He explained that before the problem of solving surface finish control was undertaken at all, the technical staff procured copies of practically everything that had been written on the subject.

He explained also that there never was complete understanding between different departments engaged in the manufacture of the bomb sight as to just what the best surface finish for each part should be.

"The problem of control resolved itself into this," he said. "If the product engineer could place on a drawing a definite maximum surface roughness for each critical surface, then the machining, assembly and inspection departments would be on a common ground, for nothing caused more discussions between machine and assembly units than to have a batch of parts, otherwise dimensionally perfect, rejected over a mere difference of opinion as to surface roughness requirements.

"The production department had been educated as to just about what the roughness of each surface should be, so that sights when completed, would pass the Navy test. So, the plan was followed of taking 30 parts just before their assembly into the sight and measuring their roughness at that point. When these measurements were plotted, we obtained, in most cases, a very normal distribution. Some few were quite a bit rougher than the average, some quite a bit smoother. This plotted data gave the engineer a picture of what surfaces were actually going into the sight and how the processes producing these surfaces were behaving."

Mr. Cosgrove declared that to enable all departments to have some means of comparison, a set of surface finish samples were made up, one for each of the common operations, such as grinding, turning, etc., and for cylindrical and flat stock. These, he said, represented the range from smoothest to roughest surface that it was possible to produce from that type of operation.

"To give the engineer a further picture of conditions in a pair of mating parts," Mr. Cosgrove explained, "the data regarding them was tabulated on graphs."

He exhibited a series of illuminated slides showing the roughness figures of various tabulations. With other slides he showed how the graphs were prepared for the various departments to provide them with data on the various degrees of surface roughness as disclosed in the samples tested. The distribution of roughness in the tested parts were plotted side by side to provide a comparison of mating parts. This type of study, according to Mr. Cosgrove, showed that

greater roughness toleration could be allowed in many cases.

A technicolor feature produced by *Walt Disney* on jet propulsion showing the P-80 motor in action was shown as another feature of the educational program.

President *D. N. Eldred* presided over the business session. Six new members were initiated: *Ernest Hamor* and *Fayne Board* of Chrome Nickel Plating Co.; *Myron Norman* of L. H. Butcher Co.; *Orville Carson*, Specer Plating Co.; *Leon Kadson*, Crown City Plating Co., and *Willis H. Breese*, Russill Plating Wks.

The following guests were introduced: *A. M. Max*, Indianapolis Branch, R. C. A. Victor Division; *Louis G. Shoals*, Latex Seamless Products; *Sol Berg*, Beverly Craft Co.; *R. Tucker*, Douglas Aircraft Co., Long Beach; *Donald Keating*, Turco Products, Inc., and *A. J. Conahan*, General Electric Co.

It was reported that the Los Angeles Public Library had decided to establish for reference purposes a complete file of the back numbers of the *Review* and the *Plating and Finishing Guidebook*, and would subscribe to future issues of those publications. Members of the branch were requested to provide the secretary with a list of the back numbers of the publications which they could supply in order to compile a complete set of each for presentation to the library.

Upon motion of *Don H. Bedwell*, the membership voted to have the branch purchase 50 copies of the *Guidebook* from *Metal Industry Publishing Co., Inc.*, New York, for distribution at cost to members desiring a copy.

Official action was taken to have the branch sponsor the annual educational session at the *Los Angeles Breakfast Club* on March 22, or as close to that date that the premises will be available.

A committee of past presidents of the branch was appointed by Chairman Eldred to make arrangements for the educational session. The committee is composed of *Marcus Rynkofs, Earl Coffin, Don H. Bedwell, John Merigold, Clarence Thornton, Ed Wells, Joseph Sunderhaus, Ray Bray* and *Emmet H. Holman*.

CHICAGO BRANCH

The regular monthly meeting of the Chicago branch of the American Electroplater's Society was held at the Atlantic Hotel as usual, on the second Friday of November. Mr. *E. G. Coffey*, of the *Matchless Metal Polish Co.*, presented the attending membership with one of the most provocative discussions it has been their pleasure to have in a long time. His topic, "Polishing and Buffing," was quite general. He outlined various methods of operation, discussed wheel speeds, and commented on the selection of the proper wheel and polishing or buffing compositions for the job in hand.

Mr. Coffey also spoke about sand bobbing and touched on the various methods of applying compositions on the wheel, including the spraying method. Since everyone has different ideas on the proper way to operate polishing and buffing departments, an excellent discussion followed Mr. Coffey's paper. One interesting feature of the evening was a semi-debate between competitors. Since it is not often that two men in



THIS ZINC STAYS SHINY AND BRIGHT
. . . It's Luster-on* Dipped!

The famous Multi-Kwik Beginners' Skates shown here were handled again and again during assembly. Each part of the multiple disc wheels, each stamping which comprises the frame was picked up by many fingers—each ready to leave a tell-tale print to mar the attractiveness of the zinc-plated finish. But there's not a fingerprint in sight!

That's because Multi-Kwik adopted Luster-on* inhibited zinc bright dip as the brilliant, lasting finish to give full protection against fingermarks, age-stains and corrosion products.

Luster-on* can do it—not only during assembly—not only in packing, shipping—not only while clerks display and sell the product—but also for months after the sale is made. No wonder sales executives go for Luster-on*. No wonder product design and finishing engineers are specifying it for more and more small metal parts. Send the coupon for full data and enclose a sample part for free Luster-on* treatment. See the results for yourself!

14

Send for your free copy today!

*Patent applied for

THE Chemical CORPORATION

54 Waltham Ave., Springfield 9, Mass.

THE CHEMICAL CORPORATION
54 Waltham Ave., Springfield 9, Mass.

Please send me full particulars about Luster-on* bright dip for zinc surfaces. I am (am not) sending sample part for free dip. No obligation, of course.

Name.....

Address.....

Metal Finishing November

FOR QUALITY-PLUS PERMAG CLEANERS LEAD TRADE MARK REG. U.S. PAT. OFF.

PERMAG

insures a CLEAN Surface on metal prior to the final Finish

The perfect finish on a metal product depends much on a chemically clean under surface.

How to get this perfectly clean surface quickly and easily is of interest to every electroplater.

Those who use PERMAG Cleaning Compounds realize that they have solved the problem satisfactorily—and PERMAG users are increasing in numbers constantly, in the metal fabricating field.

Our Service Technicians will be glad to help and advise on any specially difficult problem in metal cleaning. Write or 'Phone. No obligation for interviews and suggestions.

MAGNUSON PRODUCTS CORPORATION

Manufacturers of Specialized Cleaning Compounds for Industry

Main Office: 50 Court St. BROOKLYN 2, N. Y.

In Canada: Canadian PERMAG Products Ltd., Montreal-Toronto

TANKS

for

CHEMICAL PROCESSING

PICKLING • PLATING • ANODIZING

CLEANING • DIPPING

ETCHING, etc.

LININGS OF LEAD • KOROSEAL

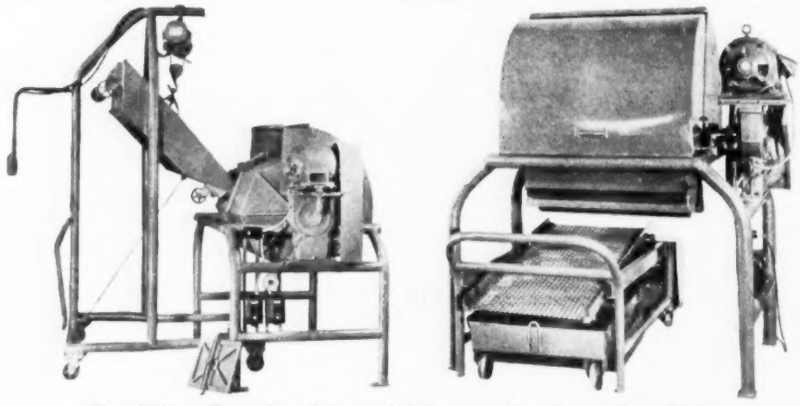
RUBBER • CERAMIC

PLASTIC • MONEL

TANK HEATING UNITS

HEIL PROCESS EQUIPMENT CORP.

12901 Elmwood Avenue -:- Cleveland, Ohio



Tumbling Barrels with variable speeds—Screening Units
Storage Hoppers—Hoisting Equipment

Immediate Shipment—Low Prices. *Write for free literature.*

DISTRIBUTORS OF HONITE

ALMCO, INC.

556 HIGH STREET, NEWARK 2, N. J.—Mitchell 2-6390

the same field will let their hair down in public, the Chicago branch feels that it gained considerably by *Mr. C. Kocour*, of the *Kocour Co.* adding his comments on the same topic. The branch feels that this was one of the most interesting thought provoking meetings it has ever had.

AMERICAN SOCIETY FOR METALS

NATIONAL METAL SHOW

At the 28th annual meeting of the National Metal Congress and National Metal Exposition held in Atlantic City November 18-22, two papers of interest to the electroplating field were given and many exhibits by manufacturers and suppliers of metal finishing materials were presented.

The first paper, Stress Cracking of Electroplated Lockwashers, by *K. B. Valentine*, was concerned with techniques involved in the elimination of stress cracks and breakage in lockwashers due to hydrogen embrittlement. The second paper, Measurement of Embrittlement During Chromium and Cadmium Electroplating and the Nature of Recovery of Plated Articles, by *Carl A. Zapffe* and *M. Eleanor Haslem*, was concerned with further problems of hydrogen embrittlement.

The exhibitors included several equipment, metal cleaning and plating supply manufacturers as well as numerous paint and paint-equipment makers.

The attendance was fully as good as expected, many visitors coming from far points.

NATIONAL ASS'N OF CORROSION ENGINEERS

ANNUAL CONVENTION

The *National Association of Corrosion Engineers* will hold its annual convention in the Palmer House, Chicago, Ill., on April 7, 8, 9 and 10, 1947.

There will be symposiums of the following industries: Water, Electrical, Chemical, Communications, Gas, Oil, Cathodic Protection, and General. In addition to the technical sessions, N. A. C. E. is sponsoring 100 exhibits on corrosion-inhibiting products and supplies.

Further information concerning the convention may be obtained from *Elton Sterrett*, Executive Secretary, 905 Southern Standard Bldg., Houston 2, Texas.

Give

★ ★ ★

USO

★ ★ ★

It still means a lot to them

News from California
By **FRED A. HERR**

After four years of service in Naval aviation, *George M. Kent* is now active as head of the recently established *George M. Kent Co.*, 223 North San Fernando Rd., Los Angeles. He operates an analytical, research and consulting laboratory, providing a service in plating solution analysis and general trouble-shooting for the trade in the Los Angeles area. Pre-war, Kent was affiliated with the plating division of *Norris Stamping & Mfg. Co.* of Los Angeles, where he established the *Norris Control Laboratory*.

With his plans for a new $50,000 silver and gold finishing shop indefinitely deferred by a "non-essential" ruling by the C.P.A., *A. H. Dibbern*, silversmith, 213 South Glendale Blvd., Glendale, Calif., has had to warehouse the new tanks and machinery he had already acquired for the proposed new plant. Dibbern specializes in plating silver, gold and other precious metals and refinishing antiques. The work is handled for him on a contract basis by *Joe Sunderhaus*, who formerly was foreman of the *Olds Band Instrument Co.*

Leon Kadson, formerly research chemist for *Cherry Rivet Co.*, Los Angeles, is now chief chemist for *Crown City Plating Co.*, 165 Fair Oaks Ave., Pasadena. *Ray Bray* is shop foreman at Crown City.

C. G. Spence, head of *Spence Electroplating Co.*, Los Angeles, escaped with minor injuries when his plane made a forced landing in a lemon grove recently. Mr. Spence, who owns and pilots his personal plane, is the only "*Flying Plater*" affiliated with Los Angeles Branch of the A. E. S.

The ritual used by Los Angeles Branch, A.E.S., for the initiation of new members made such a favorable impression on *J. P. Pattenger*, president of San Francisco Branch, when he attended the October meeting in Los Angeles, that he requested a copy of the

SUPPLIES

These are difficult times for the metal finisher to keep going, due to shortages in first one item and then another.

Nobody can supply material which is nonexistent; but it pays best to deal with a firm with wide supply connections.

Such a firm can often procure from some source a particular article which cannot be secured at all by someone with more limited connections.

MUNNING & MUNNING, Inc.

Designers . . Engineers . . Manufacturers

Main Office and Plant, 202-208 Emmett St.
NEWARK 5, N. J.

New York Philadelphia Woonsocket, R. I.

THE MUNNING LINE

DEPENDABLE QUALITY

CHROMIUM PLATING
SCREWS-RIVETS-WASHERS
SMALL PARTS, ETC.

THE CHROMIUM PROCESS CO.
Shelton, Conn.

NICKELOID METALS (Pre-Plated)

NICKEL · CHROMIUM · BRASS · COPPER
Electro-plated TO ALL COMMON *Base* METALS
ALSO LACQUERED COLORS
SHEETS AND COILS

AMERICAN NICKELOID COMPANY
Established 1898 PERU, ILLINOIS

AVAILABLE ON SHORT DELIVERY

Four Motor-Generators From a Cancelled Order in Process

4—7500/3750-Ampere, 12/24-Volt, 40°C, 360-rpm, motor-generator sets with 150-horsepower synchronous driving motors, direct-connected exciters and standard generator control panels with full-voltage magnetic starters for *440-Volt, 3-Phase, 60-Cycle power supply.

1—Unit with 80% leading Power Factor Motor available for shipment in December 1946.

3—Units with unity Power Factor Motors available for shipment in January, 1947.

* *Can be furnished also for 220-volt, a-c Power Supply.*

For complete specifications, prices and sales conditions, contact:

THE ELECTRIC PRODUCTS COMPANY
1725 Clarkstone Road, Cleveland 12, Ohio

FOR RESULTS ADVERTISE IN METAL FINISHING

*Are Your Coatings...** TOO THIN? TOO THICK? NON-UNIFORM?

* PLATINGS - PAINTS - ENAMELS - FILMS

THE AMINCO-BRENNER

MAGNE-GAGE gives the answer...



- RAPIDLY
- ACCURATELY
- NON-DESTRUCTIVELY

Whether you wish to measure non-magnetic coatings on magnetic base metals, magnetic coatings on non-magnetic base metals, or nickel coatings on iron or steel; it will be worth your while too . . .

Write for Bulletin MF-2125

FILMETER

Measures the thickness of non-conducting coatings on non-magnetic base metals, also anodized coatings on magnesium, aluminum, and aluminum alloys. Measurements made electrically without destroying the coating being measured.

Write for Bulletin MF-2139

AMINCO AMERICAN INSTRUMENT CO. *Scientific Instruments*

8030 GEORGIA AVENUE SILVER SPRING, MARYLAND

QUALITY – NEW

ELECTROPLATING & POLISHING EQUIPMENT & SUPPLIES IN STOCK FOR IMMEDIATE SHIPMENT

GENERATORS • RECTIFIERS • BARREL PLATERS
POLISHING LATHES • BUFFING LATHES
TUMBLING BARRELS • SOLUTION FILTERS
TANK RHEOSTATS • CENTRIFUGAL DRYERS
TANKS: Steel or Wood, Lined or Unlined
BLOWERS

M. E. BAKER COMPANY

143 SIDNEY STREET CAMBRIDGE 39, MASS.

REPRESENTING THE COUNTRY'S FOREMOST MANUFACTURERS

"A Quarter Century of Service"

ritual for possible use by the Bay City group.

The ritual, in which the initiation officer outlines the functions and objectives of the A. E. S. to the candidates in impressive fashion; was prepared by a special committee of Los Angeles Branch several years ago when it was felt that initiations should be invested with more dignity and formality than the mere handshake with which new members were formerly inducted.

T. W. Rawlings has been named sales promotion manager for *Kelite Products, Inc.*, Los Angeles, in which capacity he will handle all sales promotion activity, including relations with the firm's advertising agency. He replaced *Allen W. Schmidt* who resigned recently to join the staff of *The McCarty Co.*, national adventising egents.

The first post-war *Western Metals Congress and Exposition* will be held in Oakland, land, Calif., for six days beginning March 22, 1947, under the sponsorship of the *American Society for Metals* and West Coast chapters of the A. S. M. The last event of this type was held in Los Angeles in 1941.

Technical Literature

The latest collection of technical and operating data on metallizing processes is contained in the fourth edition of the *Metallizing Handbook*, published by *Metallizing Engineering Co., Inc.*, Long Island City 1, N. Y., price $2.00.

In addition to data on preparation of surfaces, metallizing technique and finishing procedure, complete data on corrosion resistance, specific gravity, hardness, bond strength, tensile strength and relative shrink are contained in many of the chapters.

Profusely illustrated with pictures, drawings, diagrams, charts and graphs, this 86-page, pocket size handbook presents both practical and technical aspects of the metallizing process in complete detail.

Letters to the Editor

The following letter contains additional information on plating on aluminum. The hints given supplement the process as described in an article by Mitchell Raskin, entitled "Electroplating of Aluminum and its Alloys," which appeared in the August, 1946 issue of METAL FINISHING.—Ed.

In connection with the article on "Electroplating of Aluminum and its Alloys," the following observations can be made:

The use of one ounce of citric acid and 8 ounces of Rochelle salts in a Rochelle copper bath as the first coat after the zincate dip greatly improves the chances of a perfect, pit-free, final electrodeposit.

Replacing most but not all, sodium salts with potassium compounds, especially the

CHROMIC ACID

99.75% PURE

With two complete, independent plants at Jersey City and Baltimore, and its own supply of the basic raw material Chrome Ore from company owned and operated mines, Mutual is the world's foremost manufacturer of Chromic Acid.

MUTUAL CHEMICAL CO. NEW YORK

OVER A CENTURY OF CHROMIUM CHEMICAL PROGRESS

Bichromate of Soda

Bichromate of Potash

MUTUAL CHEMICAL COMPANY OF AMERICA

270 MADISON AVENUE NEW YORK 16, N.Y.

PLATING RACKS

by JOSEPH NOVITSKY

- We specialize in plating racks of our own patent.
- Constructed without screws, rivets, solder, brazing, welding.
- We design racks to suit your individual problem.

JOSEPH NOVITSKY

Office: 104-17 199th St., Hollis 7, L. I., N. Y.
(Phone—HOllis 5-6871)

Factory: 147-24 Liberty Ave., Jamaica 4, L. I., N. Y.
(Phone—REpublic 9-7223)

sodium cyanide with potassium cyanide, permits quick plating of a smooth, well adhering deposit.

Following the Rochelle flash, a "Speculum" deposit, containing copper and tin (copper cyanide and stannate) with traces of cadmium cyanide (or cadmium oxide) and zinc cyanide, or the bath known as "Spekwhite," insures a perfect cushion for almost any other deposit such as gold, rhodium, chromium or black nickel.

One-half minute of either of these alloy deposits is ample, and the Rochelle bath is also to be used for one-half minute.

L. L. L.

Philadelphia 19, Pa.

METAL FINISHING
11 West 42nd Street,
New York 18, N. Y.

Gentlemen:

Have not as yet received the 1946 Guidebook.

Always look forward to this as I find it an invaluable ready reference that can be referred to many times a day as the occasion may require. I would not for the world want to be without the latest issues.'

Sincerely yours,
P. B. KENNEDY.

A. E. S.
COMING EVENTS

●

Detroit Branch

ANNUAL EDUCATIONAL SESSION AND BANQUET

DECEMBER 14, 1946

HOTEL STATLER
DETROIT, MICH.

●

Newark Branch

EDUCATIONAL SESSION AND CHRISTMAS PARTY

DECEMBER 14, 1946

HOTEL ROBERT TREAT
NEWARK, N. J.

●

Indianapolis Branch

ANNUAL REGIONAL MEETING

MARCH 29, 1947

INDIANAPOLIS ATHLETIC CLUB

INDEX TO VOLUME 44

METAL FINISHING, January-December, 1946

ARTICLES

A

All Our Yesterdays 106, 161, 334, 522
Aluminum and Its Alloys, Electroplating of..... 337
American Electroplaters' Society to Hold 33rd Annual Convention at Pittsburgh, June 17-18-19-20 234
Analysis of the Present Silver Situation, An..... 384
Annual Convention at Pittsburgh, June 17-18-19-20, American Electroplaters' Society to Hold 33rd.. 234
Annual Convention of the American Electroplaters' Society Held at Pittsburgh, Thirty-third 280
Anodizing Installation, Engineering an..... 423
Anodizing Process for Aluminum, Modified Chromic Acid 479

B

Bibliography of Electrodeposited Nickel Alloys..... 429
Black Oxide Finishing, Metal Surface Preparation for 102
Bright Dipping 433
Buffing Small Parts 247

C

California, News from....37, 95, 140, 180, 271, 276, 325, 372, 418, 460, 512. 561
Characteristics, Plating Bath..... 374
Chromium Plate, Improved 531
Chromium Plating—Conclusion, The Effect of Various Surface Treatments in Cleaning and Preparing Copper, Nickel and Steel for..... 389
Chromium Plating, Effect of Various Surface Treatments in Cleaning and Preparing Copper, Nickel and Steel for 340
Cobalt, The Determination of..... 208
Colorimetric Determination of Molybdenum in Zinc Cyanide Plating Solutions 426
Coloring of Brass, Metal Coloring..... 153
Coloring of Bronze—Metal Coloring..... 331
Common Plating Bath Troubles..... 243
Common Plating Bath Troubles—Part II..... 293
Conductivity Measurements, Practical..... 58
Copper, The Electrodeposition of..... 110
Copper-Zinc Alloys, Pickling and Bright Dipping... 198

D

Determination of Cobalt, The..... 208
Developments in Silver Plating—A Review of Recent Trends 288
Developments of 1945, Technical 2
Diffused Nickel-Zinc Coatings 207

E

Effect of Various Surface Treatments in Cleaning and Preparing Copper, Nickel and Steel for Chromium Plating 340
Effect of Various Surface Treatments in Cleaning and Preparing Copper, Nickel and Steel for Chromium Plating—Conclusion, The 389
Electrodeposited Nickel Alloys, Bibliography of.... 429
Electrodeposition of Copper, The..... 110
Electrodeposition of Nickel-Cobalt-Tungsten Alloys from an Acid Plating Bath, The..... 248
Electrodeposition, Water and 472
Electroplating Business in 1945, The Job or Contract 116
Electroplating of Aluminum and its Alloys..... 337
Electroplating, Polishing and Buffing at the U. S. Naval Gun Factory, Washington, D. C..... 467
Electroplating Solutions, Tanks for..... 63
Electro-Tin as an Undercoating, Protective Value of 13
Electro-Tin as an Undercoating, Protective Value of —Conclusion 67
Engineering an Anodizing Installation 423
Evaluating Metal Cleaners, Method of..... 297

F

Fellowship Club, The International..... 239
Films and Surface Cleanliness..... 328
Films and Surface Cleanliness—Conclusion..... 386
Finishing and Plating, Surgical Instrument..... 150

G

Gas Fired Immersion Heaters Speed Up Plating Production 392
Gold, Plating with 525

H

How and Why of a Tank Rheostat, The..... 108

I

Identification of Plated Coatings 579
Improved Chromium Plate 531
International Fellowship Club, The..... 239

J

Job or Contract Electroplating Business in 1945, The 116

L

Laboratory Notes, Metallizing Non-Conductors..... 157

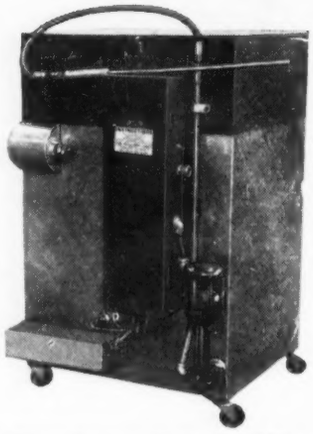
M

Metal Coloring—Coloring of Brass..... 153
Metal Coloring—Coloring of Bronze..... 331
Metal Congress to be Held in Atlantic City, National 464
Metallizing Non-Conductors—Laboratory Notes..... 157
Metal Surface Preparation for Black Oxide Finishing 102
Method of Evaluating Metal Cleaners..... 297

PHILLIPS
VAPOR DEGREASERS
MAKE METAL CLEANING
Easier • Faster
More Economical

- Metal parts and assemblies completely and safely cleaned of oil, grease and contamination in 1 to 5 minutes.
- Patented self-distilling feature reclaims up to 75% of the used solvent
- Free lifetime service policy
- Greater cleaning action—faster
- No installation problem—just plug in—all electric—entirely automatic

Let us solve your problems with "Phillsolv," the least toxic, most efficient and economical vapor degreasing solvent on the market.



ENGINEERED SERVICE

Write for handbook on "Vapor Degreasers"—there's a Phillips degreaser for every metal cleaning need.

DISTRIBUTORS IN PRINCIPAL CITIES

PHILLIPS MANUFACTURING CO.

3475 W. TOUHY AVENUE DEPT. MF-1 CHICAGO 45

DYEING
and
ANODIZING
of
ALUMINUM

★ ★

DYESTUFFS and CHEMICALS necessary for Anodizing and Dyeing Aluminum now available.

Seal your Dyed Aluminum with Alrez.

A well equipped laboratory with staff of electro-chemists and colorists to serve you. *Circular of information with price list and samples on request.*

★

EATON-CLARK CO.
1480 Franklin St. Detroit 7, Mich.
Canadian Plant, Windsor, Ont.
Established 1838—Over One Hundred Years

Methods of Preparation of Aluminum for Electrodeposition 202
Methods of Polishing 291
Modified Chromic Acid Anodizing Process for Aluminum 479
Molybdenum in Zinc Cyanide Plating Solutions, Colorimetric Determination of 426

N

National Metal Congress to Be Held in Atlantic City 461
News from California.....37, 95, 140, 180, 231, 276, 325, 372, 418, 460, 512, 561
Nickel-Cobalt-Tungsten Alloys from an Acid Plating Bath, The Electrodeposition of..... 248
Nickel-Zinc Coatings, Diffused..... 207

P

Patents 20, 74, 122, 159, 215, 257, 306, 350, 398, 440, 489. 539
Pickling and Bright Dipping Copper-Zinc Alloys... 198
Plastics, Silvering of..... 240
Plate—Conclusion, Properties of..... 476
Plate, Properties of the..... 420
Plated Coatings, Identification of 529
Plating Bath Characteristics..... 374
Plating Bath Troubles, Common..... 243
Plating Bath Troubles—Part II, Common..... 293
Plating Production, Gas Fired Immersion Heaters Speed Up 382
Plating with Gold 525
Polarization in Electroplating, the Significance of 516
Polishing Methods 291
"Polishers, Where are the"—An Answer..... 68
Porous Diaphragms and Cells, Regenerative Plating and Other Applications of..... 8
Practical Conductivity Measurements..... 58
Preparation of Aluminum for Electrodeposition, Methods of 202
Present Silver Situation, An Analysis of the..... 384
Properties of the Plate..... 420
Properties of the Plate—Conclusion..... 476
Protective Value of Electro-Tin as an Undercoating 13
Protective Value of Electro-Tin as an Undercoating —Conclusion 67

R

Regenerative Plating and Other Applications of Porous Diaphragms and Cells..... 8

S

Selective Copper Plating, Wax Masking for..... 155
Significance of Polarization in Electroplating, The.. 516
Significance of Water in the Plating Room, The... 195
Silvering of Plastics 240
Silver Plating—A Review of Recent Trends, Developments in 233
Small Parts, Buffing 247
Surgical Instrument Finishing and Plating..... 150
Surface Cleanliness, Films and..... 328
Surface Cleanliness—Conclusion, Films and..... 386

T

Tanks for Electroplating Solutions..... 63
Tank Rheostat, The How and Why of a..... 108
Technical Developments of 1945..... 2
Thirty-third Annual Convention of the American Electroplaters' Society Held at Pittsburgh..... 289
This Is Washington.....16, 71, 118, 156, 212, 254, 303, 346, 395, 437, 486 536

U

U. S. Naval Gun Factory, Washington, D. C., Electroplating, Polishing and Buffing at the.... 467

W

Washington, This Is.....16, 71, 118, 156, 212, 254, 303, 346, 395, 437, 486 536
Water and Electrodeposition..... 472
Water in the Plating Room, The Significance of..... 195
Wax Masking for Selective Copper Plating..... 155
"Where are the Polishers"—An Answer..... 68

Y

Yesterdays, All Our 106, 161, 334. 522

AUTHORS

B

Bandes, Herbert, The Electrodeposition of Copper 110
Bandes, H., The Significance of Polarization in Electroplating 516
Bengston, Helmer, Methods of Preparation of Aluminum for Electrodeposition..... 202
Black, George, Diffused Nickel-Zinc Coatings..... 207
Black, George, and Sinner, Jack, Identification of Plated Coatings 529

C

Cowley, Joseph G., and Floyd McKnight, Surgical Instrument Finishing and Plating..... 150

D

Davies, Jane; Stewart, Virginia, and Silverman, Louis, Colorimetric Determination of Molybdenum in Zinc Cyanide Plating Solutions..... 426
Diggin, Myron B., Regenerative Plating and Other Applications of Porous Diaphragms and Cells.... 8
Diggin, Myron B., Bibliography of Electrodeposited Nickel Alloys 429

E

Ernst, C. E., Wax Masking for Selective Copper Plating 155

F

Flint, Robert L., and Tucker, William M., Effect of Various Surface Treatments in Cleaning and Preparing Copper, Nickel and Steel for Chromium Plating 340
Flint, Robert L., and Tucker, William M., The Effect of Various Surface Treatments in Cleaning and Preparing Copper, Nickel and Steel for Chromium Plating—Conclusion 389
Forman, Howard L., Spring, Samuel, and Peale, Louise F., Method of Evaluating Metal Cleaners. 297
Fry, Albert L., Electroplating, Polishing and Buffing at the U. S. Naval Gun Factory, Washington, D. C. 467

G

Grupp, George W., This Is Washington.....16, 71, 118, 156, 212, 254, 303, 346, 395, 407, 486 536

H

Haberman, H. M., Plating with Gold 525
Hall, Nathaniel and Hogaboom, G. B., Jr., Technical Developments of 1945..... 2
Hall, Nathaniel, and Hogaboom, G. B., Jr., Tanks for Electroplating Solutions..... 63
Harris, Jay C., Films and Surface Cleanliness.... 328
Harris, Jay C., Films and Surface Cleanliness—Conclusion 386
Herr, Fred A., News from California.....37, 95, 140, 180, 231, 276, 325, 372, 418, 460, 512, 561
Herwig, Robert S., Engineering an Anodizing Installation 423
Hixson, A. Norman, and McNabb, Wallace M., The Determination of Cobalt..... 208
Hogaboom, G. B., Jr., and Hall, Nathaniel, Technical Developments of 1945..... 2
Hogaboom, G. B., Jr., and Hall, Nathaniel, Tanks for Electroplating Solutions..... 63
Hogaboom, George B., Pickling and Bright Dipping Copper-Zinc Alloys 198
Hoglund, Paul F., and Holt, M. F., The Electrodeposition of Nickel-Cobalt-Tungsten Alloys from an Acid Plating Bath..... 248
Holt, M. F., and Hoglund, Paul F., The Electrodeposition of Nickel-Cobalt-Tungsten Alloys from an Acid Plating Bath..... 248

Improve Your Copper

PROSALT not only is an ideal "workhorse" for use with direct current but poduces lighter color and more ductile deposits. Ideal for copper strike—stop off for heat treat—and perfect for buffing. Sufficiently bright for direct deposit of bright nickel on polished surfaces.

The IMPROVED CATHODE EFFICIENCY of the Prosalt Bath increases the rate of the copper deposit.

Your existing copper cyanide or Rochelle bath may be converted by the addition of 130 cc. Prosalt per gal.

Make-Up Analysis Prosalt Copper Bath	Cost
Copper cyanide, 3.5 ounces per gallon	$0.0764
Sodium cyanide, 4.6 ounces per gallon	0.049
Sodium carbonate, 4.0 ounces per gallon	0.0075
PROSALT, 130 cc. per gallon	0.184
	$0.3169 per gallon

Representatives in principal cities. Write to:

PROMAT DIVISION—Poor & Company

851 SO. MARKET ST., WAUKEGAN, ILL.

McKEON'S

Zinc-Brite

TRADE MARK REG'D.

(Diluted and sprinkled over zinc solution)

Cleanses and purifies your zinc solutions.
"Saves Your Brightener".

Information, samples, service, cooperation Free!

SULPHUR PRODUCTS CO., Greensburg 7, Pa.



J. HOLLAND & SONS, Inc.

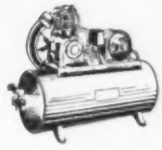
Electroplating and Finishing Equipment and Supplies



MOTOR GENERATOR SETS
All Sizes and Types
Rheostats 50-1500 amperes with or without meters.

V-DRIVE POLISHING LATHES
Sizes 3-15 horsepower. Complete unit is ball-bearing, totally enclosed, Sturdy construction.





SPRAY PAINTING EQUIPMENT
Spray guns, Air compressors, Spray booths and complete paint finishing units. Baking ovens.

J. HOLLAND & SONS, Inc.

276 South Ninth Street Brooklyn 11, N. Y.

AT BROADWAY

I

Irenus, Zachary, The Significance of Water in the Plating Room 195

L

LoPresti, Philip J., Developments in Silver Plating—A Review of Recent Trends 288

M

MacStoker, Franklyn J., and Maher, Martin F., Metal Coloring—Coloring of Brass..... 153
MacStoker, Franklyn J., and Maher, Martin F., Metal Coloring—Coloring of Bronze..... 331
Maher, Martin F., and MacStoker, Franklyn J. Metal Coloring—Coloring of Brass..... 153
Maher, Martin F., and MacStoker, Franklyn J., Metal Coloring—Coloring of Bronze..... 331
McKnight, Floyd, and Joseph G. Cowley, Surgical Instrument Finishing and Plating..... 150
McNabb, Wallace M., and Hixson, A. Norman, The Determination of Cobalt..... 208
Mohler, J. B., and Jean Sternisha, Practical Conductivity Measurements 58
Mohler, J. B., and Sedusky, H. J., Common Plating Bath Troubles 243
Mohler, J. B., and Sedusky, H. J., Common Plating Bath Troubles—Part II 293
Mohler, J. B., and Sedusky, H. J. Plating Bath Characteristics 374
Mohler, J. B., and Sedusky, H. J., Properties of the Plate 420
Mohler, J. B., and Sedusky, H. J., Properties of the Plate—Conclusion 476
Moore, H., Buffing Small Parts..... 247
Morral, F. R., Water and Electrodeposition..... 472
Mozer, Richard A., An Analysis of the Present Silver Situation 384

N

Narcus, Harold, Silvering of Plastics..... 240

O

Oathout, E. E., "Where are the Polishers"—An Answer 68

P

Peale, Louise F., Spring, Samuel, and Forman, Howard I., Method of Evaluating Metal Cleaners. 297
Pray, H. A., and Slunder, C. J., Modified Chromic Acid Anodizing Process for Aluminum..... 479

R

Raskin, Mitchell, Electroplating of Aluminum and its Alloys 337

S

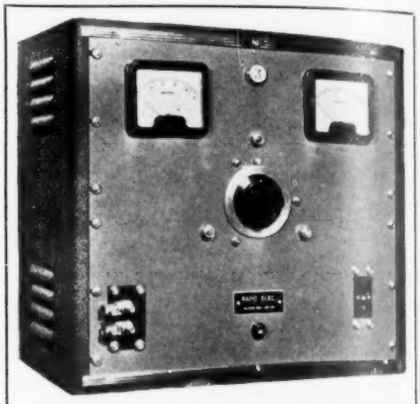
Sedusky, H. J., and Mohler, J. B., Common Plating Bath Troubles 243
Sedusky, H. J., and Mohler, J. B., Common Plating Bath Troubles—Part II..... 293
Sedusky, H. J., and Mohler, J. B., Plating Bath Characteristics 374
Sedusky, H. J., and Mohler, J. B., Properties of the Plate 420
Sedusky, H. J., and Mohler, J. B., Properties of the Plate—Conclusion 476
Shomberg, Bertram, Metallizing Non-Conductors—Laboratory Notes 157
Schulze, Arthur P., Metal Surface Preparation for Black Oxide Finishing..... 102
Silverman, Louis, Stewart, Virginia, and Davies, Jane, Colorimetric Determination of Molybdenum in Zinc Cyanide Plating Solutions..... 426
Sinner, Jack, and Black, George, Identification of Plated Coatings 529
Slunder, C. J., and Pray, H. A., Modified Chromic Acid Anodizing Process for Aluminum..... 479
Soderberg, Gustaf, Bright Dipping..... 433
Snelvin, George, All Our Yesterdays..106, 161, 334, 522
Spring, Samuel, Forman, Howard I., and Peale, Louise F., Method of Evaluating Metal Cleaners. 297
Sternisha, Jean, and J. B. Mohler, Practical Conductivity Measurements 58
Stewart, Virginia; Silverman, Louis, and Davies, Jane, Colorimetric Determination of Molybdenum in Zinc Cyanide Plating Solutions..... 426
Sussman, H. W., The How and Why of a Tank Rheostat 108

T

Tucker, William M., and Flint, Robert L., Effect of Various Surface Treatments in Cleaning and Preparing Copper, Nickel and Steel for Chromium Plating 340
Tucker, William M., and Flint, Robert L., The Effect of Various Surface Treatments in Cleaning and Preparing Copper, Nickel and Steel for Chromium Plating—Conclusion 389

W

Wells, E. W., Polishing Methods..... 291
Wernick, S., Protective Value of Electro-Tin as an Undercoating 13
Wernick, S., Protective Value of Electro-Tin as an Undercoating—Conclusion 67



SELENIUM RECTIFIERS

Designed especially for electroplating. Conservatively rated to insure long life. Sensitive and accurately calibrated instruments. Various models. For complete information and prices write

RAPID ELECTRICAL CO.
2849 Middletown Rd., Bronx 61, N. Y.

LaMOTTE CONTROL EQUIPMENT
for the
ELECTROPLATER and ELECTROTYPER

As an aid in the control of plating baths of
NICKEL, ACID ZINC, TIN, CYANIDE
ACID COPPER, CADMIUM, BRASS and BRONZE



LaMotte Block Comparators

for pH tests to accurately control the acidity and alkalinity of nickel, zinc, tin or cyanide baths. Inexpensive and easy to operate. A test can be made in a few minutes.

LaMotte Acid-Copper Analytical Set

for accurately determining and regulating the acid and copper content of the bath to insure uniform results.

Other LaMotte Outfits for determining Chlorides, Nickel Content, Iron Content and positive control of Cyanide Copper, Acid Zinc, Cyanide Zinc, Cadmium, Brass and Bronze plating solutions.

Write for further information and Plating Control Reports.

If you do not have the LaMotte A B C of pH Control, a complimentary copy will be sent upon request without obligation.

LaMOTTE CHEMICAL PRODUCTS CO.
Originators of the Practical Application of pH Control
DEPT. MF TOWSON 4, MD.

Do you have a problem of polishing metals? Are you now deburring, cutting down and polishing all types of metals by the slow method? Why not check LUPOMATIC'S method. It will save you time, money and improve your product.

Full information sent on request.

LUPOMATIC TUMBLING MACHINE CO., Inc.
4510 BULLARD AVE. NEW YORK 66, N. Y.

RANDALL

—FOR—

DEGREASERS

LEAD— TANKS —RUBBER

POLISHING LATHES

RECTIFIERS

Jewelry Plating Tables

RANDALL ENGINEERING CO.

410-412 E. 93rd ST. NEW YORK 28

YES IT'S NEW

Water Soluble Buffing Compounds

RED ROUGES WHITE ROUGES

TRIPOLIES

Send Us Your Problems on Buffing

"It's the Finish That Counts"

UNITED LABORATORIES CO.

Linden, New Jersey LInden 2-4059

BRISTOL BRASS AND BRONZE

Sheet, Rod, Wire

THE BRISTOL BRASS CORP., BRISTOL, CONN. • 15 PARK ROW, N. Y. • HOSPITAL TRUST BLDG., PROVIDENCE, R. I.

INDIAN BRAND

TURKISH EMERY

This old time famous brand of emery is now in stock. Many have been waiting for it. Also available are POLISHING ABRASIVE —best for finest finishing and AMERICAN EMERY—most economical.

HAMILTON

EMERY & CORUNDUM COMPANY

Chester Mass.

SOMMERS BROS. MFG. CO.

MFRS. OF "BEACON"

Plating and Polishing Supplies and Equipment —Complete Semi and Full Automatic Installations—Gold, Silver and Chrome Rouge, Stainless Steel and Satin Finish Compounds—Buffs, Polishing and Felt Wheels.

SAMPLES FURNISHED ON REQUEST.

3439 NO. BROADWAY

ST. LOUIS 7, MO.

Zialite

Reg. U. S. Pat. Office

FOR NICKEL PLATING

The one bath especially designed for plating WHITE METAL ALLOYS including ZINC, LEAD and ALUMINUM.

FOR

HARD CHROMIUM

USE

Zialite

ADDITION AGENTS

Send a sample of your present bath to see if it is suitable for conversion to this improved formula.

ZIALITE CORPORATION

92 Grove Street, Worcester 5, Mass.

Truly—Three Great Finishes!!

CHROMIUM—UDYLITE

SHERARDIZING

For over a quarter of a century building and installing portable sherardizing furnaces and equipment; metal finishing and plating. We invite your inquiry.

THE NATIONAL SHERARDIZING & MACHINE CO.

Office & Factory Hartford, Conn

Foreign Representatives—Oliver Bros., Inc. 417 Canal St., N. Y. City

BUFFS, CLEANERS

BUFFING COMPOSITIONS

NICKEL ANODES

CHEMICALS AND GENERAL SUPPLIES

JACOB HAY COMPANY

4014 W. Parker Avenue

Chicago, Ill.

Albany 2742

Hartford GUARANTEED



STEEL BALLS

Best for Burnishing . . . Perfect for Polishing. No culls, no cracks.

Mixtures as Required

THE HARTFORD STEEL BALL CO.

HARTFORD 6, CONN.

EXPERT

HARD CHROME PLATING

COPPER, ZINC, TIN, CADMIUM

All sorts of commercial heat-treating

NITRIDING

AGERSTRAND CORPORATION

Muskegon, Michigan

To our friends and patrons throughout the United States and foreign countries:

A prosperous and healthful New Year!

Let us hope that with the beginning of 1947 there will be an end of all wars and that we may have eternal peace.

LEWIS ROE MFG. COMPANY

1042-1050 DeKALB AVE.

BROOKLYN, NEW YORK

RIBBON ZINC

For stamping and drawing

FUSE METAL

For fuse elements

ZINC WIRE

THE PLATT BROS. & CO.

Waterbury, Conn.

OXY-DYZ-ENE

HIGHEST STRENGTH

OXIDIZING AGENTS

POSSIBLE TO PRODUCE

Sold in LUMP and LIQUID FORMS by Leading Plater Supply Houses

Manufactured For 68 Years By

KREMBS & COMPANY

669 W. OHIO ST. CHICAGO, U.S.A.

For dependable buffing and polishing compounds, Rouges and Tripoli for all metals

write

Perkins Rouge and Paint Co.

Milford, Conn.

BUSINESS WANTS For Sale—Equipment, Etc.

Display Advertisements, One Column Wide, $10 per inch, Each Insertion

FOR SALE

(AVAILABLE FOR IMMEDIATE SHIPMENT)

THE FOLLOWING EXCELLENT USED AND REBUILT ELECTROPLATING MOTOR GENERATOR SETS, WITH FULL CONTROL EQUIPMENT:

2—15000/7500 AMPERE, 6/12 VOLT, COLUMBIA.
1—5000/2500 AMPERE, 6/12 VOLT, COLUMBIA.
1—5000/2500 AMPERE, 6/12 VOLT, EAGER.
1—4000/2000 AMPERE, 3/6 VOLT, HANSON-VAN WINKLE.
1—3000/1500 AMPERE, 6/12 VOLT, BENNETT & O'CONNELL.
1—2500/1250 AMPERE, 6/12 VOLT, HANSON-VAN WINKLE.
1—2000/1000 AMPERE, 6/12 VOLT, HANSON-VAN WINKLE-MUNNING.
1—2000/1000 AMPERE, 10/20 VOLT, CHANDEYSSON, 25° UNIT.
1—1500/750 AMPERE, 6/12 VOLT, HANSON-VAN WINKLE.
1—1000/500 AMPERE, 6/12 VOLT, HANSON-VAN WINKLE.
4—1000/500 AMPERE, 6/12 VOLT, CHARLES J. BOGUE.
1—500 AMPERE, 6 VOLT, HANSON-VAN WINKLE.
1—300 AMPERE, 6 VOLT, HANSON-VAN WINKLE.
1—200 AMPERE, 7½ VOLT, HOBART.
1—200 AMPERE, 7½ VOLT, CHANDEYSSON.
1—150 AMPERE, 7½ VOLT HOBART.
2—125 AMPERE, 15 VOLT, KIMBLE.
1—125 AMPERE, 7½ VOLT, CHANDEYSSON.
1—100 AMPERE, 7½ VOLT, WEIDENHOFF.

ANODIZING MOTOR GENERATOR SETS:

1—500 AMPERE, 24 VOLT, HANSON-VAN WINKLE.

MISCELLANEOUS

1—MEAKER SEMI-AUTOMATIC CONVEYOR UNIT—For Cyanide Plating. Excellent Condition. 20 ft. x 3½ ft. x 4 ft.
1—WESTINGHOUSE SLIP-RING MOTOR—200 HP, 440 VOLT, 3 PHASE, 25 CYCLES, 475 RPM.

WRITE FOR DETAILS

M. E. BAKER COMPANY 143 SIDNEY ST. CAMBRIDGE, MASS.

LOW VOLTAGE

Motor Generator Sets IN STOCK

1—6000/3000 ampere, 18/36 volt, Electric Products synchronous motor generator set, 600 RPM, 3 phase, 60 cycle, 220/440 volt.
1—5000/2500 ampere, 6-8/12-16 volt, Columbia Timken Bearing motor driven plater, 720 RPM, 3 phase, 60 cycle, 220/440 volt.
1—2000/1000 ampere, 6/12 volt, Hanson-Van Winkle synchronous motor driven plater, 900 RPM, 3 phase, 60 cycle, 220/440 volt.
1—1500/750 ampere, 6/12 volt, Eddy.
1—1000 ampere, 15 volt, General Electric.
1—300 ampere, 15 volt, General Electric.
1—750 ampere, 15 volt, Star.
1—1500 ampere, 15 volt, Star.
2—200 ampere, 20 volt, Star.
1—200 ampere, 25 volt, Star.
3—250 ampere, 25 volt, Star.
1—1600 ampere, 30 volt, Westinghouse.
2—205 ampere, 32 volt, General Electric.
1—1000 ampere, 33 volt, General Electric.
3—205 ampere, 42 volt, General Electric.
2—800 ampere, 50 volt, General Electric.
1—400 ampere, 60 volt, General Electric.
1—1000 ampere, 75 volt, General Electric.

Rebuilt—1 YEAR GUARANTEE

L. J. LAND, Inc.

146-148 Grand St., New York 13, N. Y.

CANAL 6-6976

FOR SALE

(AVAILABLE FOR IMMEDIATE SHIPMENT)

POLISHING LATHES—NEW & USED ALL SIZES—CONSTANT & VARIABLE SPEED 3 phase, 60 cycle, 220/440 volt.

POLISHING WHEELS—CANVAS—BRAND NEW HANSON-VAN WINKLE 12" x 2" x 1¼"—Priced at 35% below cost.

CYLINDRICAL TUBE POLISHER—PRODUCTION NO. 101 CENTERLESS TAPER FEED. Capacity ¼" to 6" diameter, 10 H.P. 3 phase, 60 cycle, 220/440 volt.

BARRELS—BRAND NEW—MECHANICAL—BURNISHING—TUMBLING. Various sizes, Belt and Motor Drive—3 phase, 60 cycle, 220/440 volt.

RECTIFIERS—BRAND NEW GENERAL ELECTRIC COPPER OXIDE 300 ampere, 6 volt, including complete control equipment 3 phase, 60 cycle, 220 volt.
MALLORY "UDYLITE" Rebuilt 1440/720 ampere, 6/12 volt, 3 phase, 60 cycle, 220/440 volt with starter.

SEMI-AUTOMATIC PLATING MACHINE—LATE TYPE HANSON-VAN WINKLE 10' x 3 1/3' x 3'—Reeves Drive, 3 phase, 60 cycle, 220/440 volt, in service only 2 weeks.

MALL TOOL FLEXIBLE SHAFTS—USED, 1 to 3 H.P.—3 phase, 60 cycle, 220 volt.

PLATING GENERATORS—100 ampere to 5000 ampere, 6/12 volt, new and used—write for details.

CLINTON SUPPLY COMPANY

112 SOUTH CLINTON STREET CHICAGO 6, ILLINOIS

REBUILT AND GUARANTEED POLISHING AND ELECTROPLATING EQUIPMENT

PLATING DYNAMOS AND GENERATOR SETS

All sizes carried in stock of tumbling and plating barrels, and other equipment for the metal finishing trade.

Used equipment bought for cash. If you have metal finishing equipment for disposal, send us full details, and we will contact you.

H & S EQUIPMENT & SALES CO.

Broadway at Rodney Street, Brooklyn 11, New York

EVergreen 7-3317

FOR SALE

1—10 H.P. 220 Volt, 3 phase, 60 cycle 600 RPM Motor.

1—Industrial Filter Unit, 200 Gallon size for cyanide baths.

CAnal 6-3956-7

BEAM-KNODEL COMPANY

195 Lafayette St., New York 12, N. Y.

FOR SALE

AVAILABLE FOR PROMPT SHIPMENT PLATERS AND ANODIZERS

50 amp. 6 volt Leland, with 110/220 volt 1 phase, 60 cycle motor drive.
60 amp. 16 volt Western Elec. 1750 RPM, belt drive.
100 amp. 6 volt Columbia, 1800 RPM, belt drive.
100/125 amp. 7½ volt, Hobart with 220 volt, 3 phase 60 cycle, 1750 RPM motor drive.
300 amp. 42 volt Elec. Prod. with 20 HP, 220/440 volt 3 phase, 60 cycle, 1750 RPM motor.
1200 amp. 40 volt, Westinghouse with 75 HP 220 volt, 3 phase, 60 cycle, 900 RPM motor.
3000 amp. 40 volt, Gen. Electric with 150 HP 3 phase, 60 cycle, 900 RPM motor.

All units in Stock—available for inspection.

THE MOTOR REPAIR & MFG. CO.
1555 HAMILTON AVE. CLEVELAND 15, OHIO

FOR SALE

Unichrome, 20" x 50" sheets, thickness from 1/32" to 3/8". Koroseal, 39" wide, 1/32" thick, rolls.

Tin and Lead Fluoborate in rubber drums.

Weigand Immersion Heaters, lead and monel sheathed, 5 and 8 kw., new, automatic switches for same, new.

Temperature Recorders, 24 hour, 50 to 200 degrees F., new.

Rheostats; 500 volt, 16 ohms; 250 volt, 2.5 ohms; new.

Neoprene Gloves, sizes 9 to 11, new.

HARRY M. RIGHTER, INC.
Foot of West 45th Street
Cleveland 2, Ohio

FOR SALE

Insulated, Gas-Fired Baking Oven, with full thermostatic Controls. Size 10'6" x 7'9" x 4'0". Blue Prints Furnished on Request. Write: Folding Carrier Co., 1238 W. Main St., Oklahoma City 4, Okla.

FOR SALE

One metal cleaning machine, conveyor type, manufactured by Metalwash Machinery, Irvington, N. J. In perfect condition. Can be seen operating. Address: American Venetian Corporation, Haskell, New Jersey.

WANTED

A nationally distributed machine, with patents pending, having no counterpart in the plating industry, is in the process of reorganization. Dealers have been established and machines manufactured with the result that it is in successful operation in twenty-five cities. The company needs capital for manufacturing and development, also capital for more extensive advertising and sales follow up. Forty thousand dollars and better now invested by sole owner. Several propositions are in order. Address: November 13, care Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

AUTOMATIC POLISHING MACHINE

WANTED—Rotary type 4 or 5 station Acme, Hammond, packermatic automatic polishing machine suitable for 11 to 12 inch diameter lamp bases and small parts. Address: December 15, care Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

WANTED

Small plating company in Cleveland or Pittsburgh district. Address: December 12, care Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

For Results Advertise in Metal Finishing

SITUATIONS OPEN

WANTED

SITUATION OPEN—Chemist or chemical engineer who is sales minded, for No. 1 assistant position with national organization furnishing specialized chemicals for metal cleaning, finishing, etc. Company at present is well staffed with technical men and has a good field selling organization. Needs an individual to help coordinate efforts of both groups. Should be familiar with plating and finishing operations in metal working plants. Some sales or technical field service experience desirable because it will be necessary to work with salesmen and customers. Age 28-35. Location, mid-west. Write fully and in confidence to Box 500, care Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

PLATER

SITUATION OPEN—High calibre plater having a knowledge of plastic and metal plating to manage small, completely equipped plant in New York City. Interesting proposition for right man. Address: December 10, care Metal Finishing, 11 West 42nd Steet, New York 18, N. Y.

PLATING FOREMAN

SITUATION OPEN—To take charge of medium sized plating department. Must be capable of controlling and analyzing the following solutions: hot bright nickel, copper, brass, silver, gold; also barrel plating. Steady position, good wages for man who can qualify. State full particulars, experience, references, and compensation expected. Address: Blacher Bros., Inc., 299 Carpenter St., Providence, R. I.

PLATING FOREMAN

SITUATION OPEN—For plating foreman with full knowledge of gold, rhodium and nickel plating on brass jewelry. Good equipment and plant which is situated in Westchester County, 30 minutes from 42nd Street. Write your qualifications. Fine opportunity for right person. All correspondence strictly confidential. Address: December 1, care Metal Finishing, 11 West 42nd Street, New York, 18, N. Y.

POLISHING FOREMAN

SITUATION OPEN — Polishing Foreman capable of taking full charge of job shop polishing department including all finishes. Good opportunity for right man. Plant located in New York City. Address: December 11, care Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

SITUATIONS WANTED

CHEMICAL ENGINEER

SITUATION WANTED—Young Chemical Engineer with diversified background desires to head or open a plastics department to produce stop-offs, plastic coatings, and other analogous adjuncts to the electroplating field. Have new product ideas capable of immediate application. Money maker for right concern. Address: December 5, care Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

CHEMIST

SITUATION WANTED — War Veteran, Organic Chemist with Bachelor and Master of Science degrees in Organic Chemistry and three years of chemical experience within the fields of textiles, paints and varnishes and nitrocellulose products. Desires permanent position with established firm either in New York City or Nassau County. Address: E. R., care Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

FOREMAN PLATER

SITUATION WANTED—By plater, 20 yrs. experience, formerly such firms as United Chromium, Auto Industry, Detroit Job Shops, etc. Thoroughly experienced in Nickel, Copper, Chrome, Silver, Cadmium, Tin, Brass, all types barrel plating. Can install and control solutions. Heavy experience in polishing. Qualified to supervise. Prefer position metropolitan New Jersey, New York. Present location, Newark, N. J. Address: December 6, care Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

INDUSTRIAL CHEMIST

SITUATION WANTED—By Industrial Chemist with extensive and practical experience in the development, servicing and sales of Industrial Water Conditioning Chemicals, Detergents, Rust Preventives and Industrial Chemical Specialties. Desires a connection in capacity of Technical Service or Sales with enterprising organization catering to the Metal Working Industry. Address: December 7, care Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

FOREMAN

SITUATION WANTED—Foreman Plating and Lacquering Department with thirty years experience on builders, piano hardware, auto parts, electric fixtures, and flat and hollow ware. Have worked with nickel, copper, brass, zinc, silver, cadmium, and decorative and hard chrome. Address: T. B. H., care Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

PLATING SUPERINTENDENT

SITUATION WANTED—Experienced in operation of semi and full automatic equipment. Barrel burnishing and barrel plating. I have had 15 years experience with all solutions and their maintenance. Can efficiently handle production and men. Also, will furnish the best of references. Address: Shop Supt., care Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

ELECTROCHEMICAL ENGINEER

SITUATION WANTED—Chemical Engineer with 18 years extensive experience in industrial research, development and process installation: electrodepsition practically all metals, bright metal plating, gold alloys, metal finishing and allied fields; deep etching processes on aluminum. Several outstanding developments. Available part time, temporary and as consultant. Will consider full time position in New York area. Address: September 2, care Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

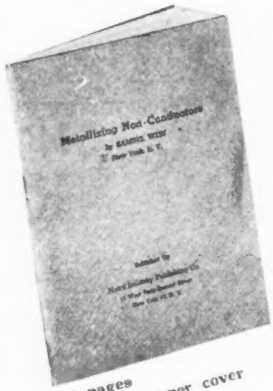
PLATING EXECUTIVE

SITUATION WANTED—I have had many years experience in the industry and I am well acquainted with the latest processes and engineering work. Address: November 11, care Metal Finishing, 11 West 42nd Street, New York 18, N. Y.

TWO NEW BOOKS

Metallizing Non-Conductors

By SAMUEL WEIN



64 pages
6½ x 7½ paper cover

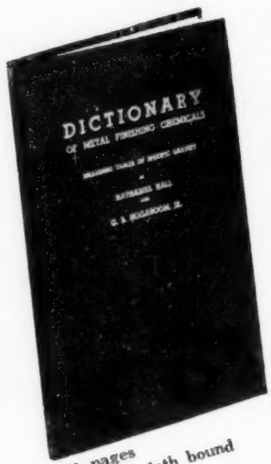
The present work deals with every known method for "metallizing" or the deposition of metals by electrolysis (plating) on non-conductors. It is divided into several sections, i.e., those processes which use chemical, mechanical and physical methods for treatment of surfaces for metallizing. In these groups the specific methods are chronologically reviewed and so the reader can very readily get a better idea of the progress made by the various workers in these arts. At the end is an alphabetical listing of contributors to the art, so that the serious workers can refer to the original sources of the information given in the text by Mr. Wein.

The text is prepared in a practical fashion so that the formulas given will be of material use and is the result of literature collected by the author for more than 25 years and which has been in use by a number of industrial concerns here in the United States and abroad.

PRICE $2.00

Dictionary of Metal Finishing Chemicals

By HALL and HOGABOOM



129 pages
5¾ x 8½ cloth bound

This volume fills the need in the metal finishing field for a handy source of information concerning the chemicals employed. The technical and common names are listed in alphabetical order together with information as to physical appearance, chemical formula, molecular weight, melting and boiling points, and solubility. Available grades, types and sizes of shipping containers are also given, all of which are of help in identifying the contents of unlabelled packages which are found in most plating rooms. A special section contains tables of degrees. Baumé and specific gravity for solutions of a great many salts. Various solutions and dips employed in the finishing department may be easily controlled by the use of a hydrometer and these tables. The authors, editors of the **Plating & Finishing Guidebook** and associate editors of **Metal Finishing**, as a result of their familiarity with the requirements of the industry, have compiled a reference volume which belongs on the shelf of every metal finisher.

PRICE $3.00

BOOK ORDERS PAYABLE IN ADVANCE

METAL FINISHING 11 W. 42nd St., New York 18, N. Y.

« « « « « INDEX TO ADVERTISERS » » » » »

A

Abbott Ball Co., Hartford, Conn. 557
Agerstrand Corp., Muskegon, Mich. 51
Almco, Inc., Newark, N. J. 560
Alsop Engineering Corp., Milldale, Conn. 42
Aluminum Co. of America, Pittsburgh, Pa. 11
American Buff Co., Chicago, Ill. 48
American Chemical Paint Co., Ambler, Pa. 558
American Instrument Co., Silver Springs, Md. 562
American Nickeloid Co., Peru, Ill. 561
Apothecaries Hall Co., Waterbury, Conn. 6
Automotive Rubber Co., Detroit, Mich. 32

B

Baird Machine Co., The, Bridgeport, Conn. 18
Baker & Co., Newark, N. J. 10
Baker, M. E., Co., The, Cambridge, Mass. 52
Beam Knodel, Inc., New York 52
Beekman Electrochemical Laboratories, New York.. 542
Belke Mfg. Co., Chicago, Ill. 19
Blakeslee & Co., G. S., Chicago, Ill. 553
Brate Co., W. C., Albany, N. Y. 558
Bristol Brass Corp., The, Bristol, Conn. 51
Bullard Co., Bridgeport, Conn. 9

C

Chemical Corp., The, Springfield, Mass. 559
Chromium Process Co., Shelton, Conn. 561
Clinton Supply Co., Chicago, Ill. 52
Crown Rheostat & Supply Co., Chicago, Ill. 35

D

Darco Corporation, New York, N. Y. 30
Davis-K-Products Co., New York, N. Y. 10
Detrex Corp., Detroit, Mich. 547
Dulite Chemicals Corp., Middletown, Conn. 552
E. I. Du Pont de Nemours & Co., Wilmington, Del. 17, 33

E

Eaton-Clark Co., Detroit, Mich. 564
Electric Products Co., Cleveland, O. 14, 561
Enthone Co., New Haven, Conn. 3

G

General Abrasive Co., Inc., Niagara Falls, N. Y... 548
General Ceramics and Steatite Corp., Keasby, N. J. 16
General Chem. Co., New York, N. Y. 15
General Electric Co., Bridgeport, Conn. 22
Granium Products, Los Angeles, Cal. 53
Green Electric Co., W., New York, N. Y. 45
Gumm Chemical Co., Inc., Frederick, Kearny, N. J. Inside Front Cover

H

H & S Engineering and Sales Co., Brooklyn, N. Y... 52
Hamilton Emery & Corundum Co., Chester, Mass... 51
Hammond Mach. Builders, Inc., Kalamazoo 54, Mich. 545
Hanson-Van Winkle-Munning Co., Matawan, N. J..49, 50
Harrison & Co., Haverhill, Mass. 556
Harshaw Chemical Co., The, Cleveland, Ohio 28
Hartford Steel Ball, Hartford, Conn. 51
Hay Co., Jacob, Chicago, Ill. 51
Heil Eng. Co., Cleveland, Ohio 560
Hinterleitner, E. J., and Associates, Westfield, N. J.. 542
Hogaboom, G. B., Jr., and Co., Newark, N. J. 542
Holland Sons, Inc., J., Brooklyn, N. Y. 565

I

Industrial Filter & Pump Mfg. Co., Chicago, Ill... 21

K

Kocour Co., Chicago, Ill. 555
Krembs & Co., Chicago, Ill. 51
Kushner, Joseph, New York 542

L

LaMotte Chemical Products, Baltimore, Md. 566
Land, Inc., L. J., New York 52
Lasalco, Inc., St. Louis, Mo. 43
Lea Mfg. Co., The, Waterbury, Conn. 1
L'Hommedieu & Sons Co., Chas. F., Chicago, Ill... 51
Lupomatic Tumbling Machine Co., New York, N. Y.. 566

M

MacDermid Incorporated, Waterbury, Conn. 54, 55
Magnuson Products Corp., Brooklyn, N. Y. 559
Mahon Co., R. C., Detroit—Chicago 56
Manderscheid Co., Chicago, Ill. 13
Metalwash Machy Co., Inc., Irvington, N. J. 557
McGean Chemical Co., Cleveland, Ohio 24
Michigan Chrome & Chemical Co., Detroit, Mich... 7
Miller Co., J. C., Grand Rapids, Mich. 20
Mine Safety Appliance Co., Pittsburgh, Pa. 34
Mitchell, Bradford Chem. Co., Bridgeport, Conn. .. 40
Motor Repair Co., Cleveland, Ohio 53
Munning & Munning, Newark, N. J. 561
Mutual Chemical Co. of America, New York, N. Y... 563

N

National Sherardizing & Mach. Co., Hartford, Conn. 51
Nelson Chemicals Corp., Detroit, Mich. 555
Novitsky, Jos., Hollis, L. I., N. Y. 563

O

Oakite Products, Inc., New York, N. Y. 4
Optimus Equipment Co., Matawan, N. J. 544
Osborn Mfg. Co., Cleveland, Ohio 8

P

Packer Machine Co., Meriden, Conn. 12
Pennsylvania Salt Co., Philadelphia, Pa. 25
Pariser Electric Motor Co., Inc., New York 44
Perkins Rouge & Paint Co., Milford, Conn. 51
Phillips Mfg. Co., Chicago, Ill. 564
Platers Laboratory Service, Elizabeth, N. J. 542
Platers Technical Service Co., New York, N. Y. 542
Plating Equipment & Supply Co., New York, N. Y. 23
Platt Bros. & Co., Waterbury, Conn. 51
Powers Regulator Co., Chicago, Ill. 34
Precision Stencils, Bronx, N. Y 53
Promat Division, Poor Co., Waukegan, Ill. 565
Puritan Mfg. Co., Waterbury, Conn. 44

Q

Quinn Co., Nelson J., Toledo, O. 550

R

Randall Welding Wks., New York 29, N. Y. 51
Rapid Electrical Co., Bronx, N. Y. 566
Richardson Allen Co., New York 556
Robinson & Son, A., New York, N. Y. 39
Roe Mfg. Co., Lewis, Brooklyn, N. Y. 51
Rolock, Inc., Fairfield, Conn. 16

S

Sarco Co., Inc., New York, N. Y. 27
Seymour Mfg. Co., Seymour, Conn. 38
Sommers Bros. Mfg. Co., St. Louis, Mo. 51
Sparkler Mfg. Co., Mundelein, Ill. 40
Speare Co., Alden, Cambridge, Mass. 36
Special Chemicals Corp., New York 554
Stevens, Inc., Frederic, Detroit, Mich. 5
Sulphur Products Co., Greensburg, Pa. 565

U

Udylite Corp., Detroit, Mich. 29
United Chromium, Inc., New York, N. Y. 26, 39, 41, 549, 551
United Laboratories Co., Linden, N. J. 51
U. S. Galvanizing & Pltg. Equipment Corp., Brooklyn, N. Y. 46

W

Wrigley, Jr., & Co., Wm., Chicago, Ill. 546
Wyandotte Chemicals Corp., J. B. Ford Division, Wyandotte, Mich. 543

Z

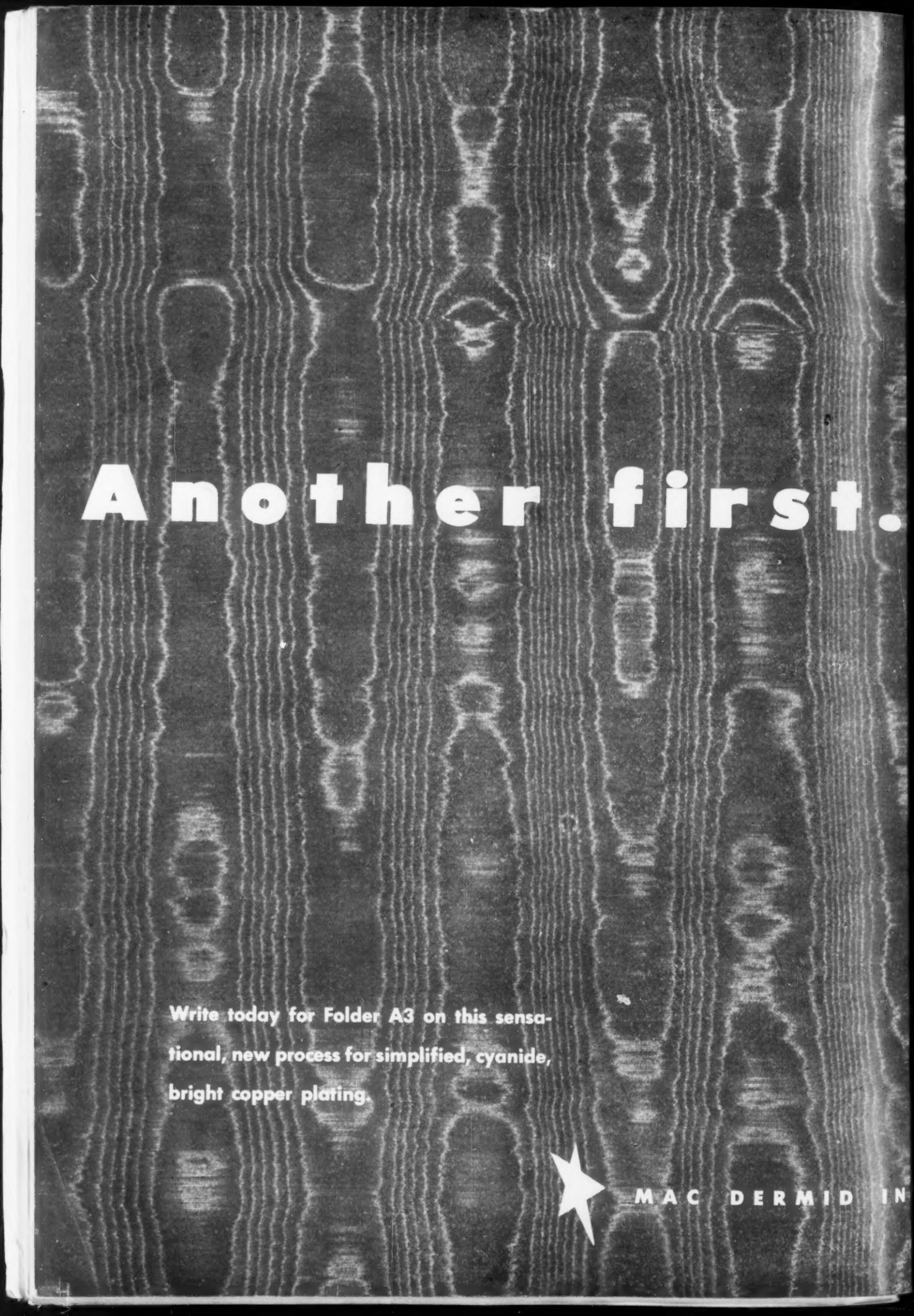
Zialite Corp., Worcester, Mass. 51

1946
PLATING & FINISHING GUIDEBOOK

$1.00 PER COPY, PAYABLE IN ADVANCE

GRANIUM
A Precious metal complex salt for Silver & Gold Plating
Used as an additive
Harder Plate
Tarnish Resistant
Cyanide & Anodes
Write for booklet.
GRANIUM PRODUCTS
2616 Downey Road
Los Angeles 23, Calif.
Chemical Engineers since 1905

PLATING RACKS DESIGNED TO MEET YOUR PARTICULAR NEED
INTERCHANGEABILITY • RUGGEDNESS • SIMPLICITY • QUICK UNLOADING AND RELOADING
Take Advantage of Our Vast Experience
PRECISION STENCILS MANUFACTURERS OF SPRAYING STENCILS, PLATING RACKS AND POLISHING CHUCKS
1105 MORRISON AVE., BRONX 59, N. Y. TEL. TIVOLI 2-6227


Another first.
Write today for Folder A3 on this sensational, new process for simplified, cyanide, bright copper plating.
MAC DERMID IN


MAC DERMID
Bright Copper
PLATING PROCESS
IN ORATED
WATERBURY 88, CONNECTICUT

Now You Can Eliminate DUST



. . . Effectively and Economically with the Hydro-Foam Collector

The Mahon Hydro-Foam Dust Collector does the job the logical, effective way—deposits all dust safely under water . . . there are no cloth screens, dust bags, jets, nozzles, or other device requiring cleaning, repair or frequent replacement. Even the most minute particles of dust are trapped and removed from the air by the Foam Bed. These collectors are produced in standard units of 3000 cfm capacity—multiple units are employed to handle any amount of air to cope with any dust condition. Have a Mahon engineer explain to you the advantages of this patented Hydro-Foam principle.

Address INDUSTRIAL EQUIPMENT DIVISION

THE R. C. MAHON COMPANY

Detroit 11, Michigan • Western Sales Division, Chicago 4, Illinois

Engineers and Manufacturers of Dust Collecting Systems, Complete Finishing Systems, Annealing Ovens, Core Ovens, and many other Units of Special Production Equipment.

REMOVES THE DUST FROM INDUSTRY

The battery of Mahon Hydro-Foam Dust Collectors illustrated above is one of two batteries serving a buffing and polishing department in one of the great mid-west automobile plants. The patented Hydro-Foam Collector may be manifolded together in batteries of two, three or four to a common sludge tank, and any number of batteries may be employed to meet capacity requirements.

MAHON

